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John F. Anderson, M. D.

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American Journal of Public Health
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SOME IMPORTANT PUBLIC HEALTH PROBLEMS.

ANNUAL ADDRESS OF THE PRESIDENT OF THE AMERICAN PUBLIC HEALTH ASSOCIATION.*

JOHN F. ANDERSON, M. D.,
New Brunswick, N. J.

FELLOW Members of the American Public Health Association, Ladies and Gentlemen: The time alloted me by the local Committee of Arrangements is not sufficient in which to discuss adequately some single phase of public health work. For that reason I have chosen to bring before your attention this evening in outline several matters that seemed to me among the most important connected with public health administration in this country.

Before doing so, I desire to report to you concerning the general welfare of the Association and of its JOURNAL. As most of you know, this is the 44th Annual Meeting of the Association. The membership of the Association in 1872, the year of its organization, was 63; our membership on September 1, 1916, was 1,647. The number of members did not reach 700 until 1910, except for a temporary increase to about 1,200 in 1893, following the meeting in Mexico City. Between that temporary increase in 1910, it fell at one time to less than 500. In 1911 the membership began to rise and in that year reached 800; since then the number has rapidly mounted, and on September 1 of this year had reached 1,647. It is recorded in the transactions of the Association that 17 members were in attendance at the meeting in 1873 out of a total membership of about 80, while that number would be counted as hardly a quorum at any single one of this year's section meetings. The rapid growth in the membership in the last four years convinces me that if some way could be provided to put at our disposal a small amount of money to be used for developing membership, we should in a short while have on our rolls 5,000 members.

The JOURNAL has also shown a healthy growth: the net paid circulation on September 1, 1914, was 1,544; on September 1, 1915, it was 1,701; September 1, 1916, it was 2,413, a percentage increase of 41.8 per cent. over 1915.

Our activities up to this time have been largely devoted to holding our annual meeting, the publication of the JOURNAL, and the preparation and distribution of standard methods par-

* Delivered at Cincinnati, Ohio, October 24, 1916.

ticularly those prepared under the auspices of the laboratory section. I believe the time has now come when we should greatly broaden our activities and begin to really serve as a clearing house for health information, and perhaps even enter the field of health propaganda.

We should increase the number of sections in the Association so that a place may be provided for those who specialize in particular fields of sanitary science in which to meet to give and receive the results of work by specialists in certain branches of sanitary science.

The Full-time Health Officer.

To those who have given attention to the administrative problems of public health work, it has become increasingly evident that the most important element in effective public health administration is the full-time, local health officer. He is the immediate cog in the mechanism of public health administration that bears directly upon the shaft around which revolves the machinery of public health as it affects the community and the individual.

We may have a throughly trained and well qualified executive at the head of the state health organization, who is provided with competent assistants in charge of the various departments that pertain to a well balanced and effective state department of health. The state health laws and regulations may be ample as regards scope and power. There may be appropriations of reasonable amounts, sufficient for carrying on the work of the central office. There may even be a distinct public sentiment among the citizens of the state in favor of the enforcement of health measures, but these agencies cannot be utilized to their full value unless there is provided, either by the state organization or by the individual communities, a trained, full-time health officer, for it is the local health officer who has to deal with the individual health problems of the community, who has to solve those problems when they arise, and who has to take the necessary steps to avoid their recurrence. He must not only be a man qualified by education and training for the duties of his office, but he must be a man with tact to minimize the opposition to the enforcement of health measures, without abating in any way their enforcement. In my opinion, it is not necessary that the local health officer should be a physician, though it is desirable if he possesses the other necessary qualifications. It is essential that he should be a full-time officer: this is more essential than a degree of Doctor of Public Health, for a man (even though he has not had a thorough education in public health, desirable as it may be) who is able to give his entire thought and time to the duties of his office, can accomplish more for his office and be of more real service to his community than the part-time health officer, with the consequent division of his thoughts and energies.

Coöperative Public Health Administration.

The administrative health organization of most of our larger cities and

some of the smaller towns are on a fairly satisfactory basis, but that of many of the smaller towns and rural communities is far from satisfactory. The highly specialized character of public health work and the financial inability of the smaller communities to support an adequately equipped health organization are in large part responsible for this condition. That neither of these conditions is insurmountable has been shown by the coöperative studies in health administration conducted in Massachusetts and in Illinois. Both Phelps and Rudiger have shown that a number of small communities may combine their resources and obtain by a system of coöperative health organization results which demonstrate that it need no longer be said that the health officer of our smaller communities is the least efficient unit of our health organization.

Application of Known Facts in the Control of Disease.

Some students of public health administration have occasionally called attention to the tardiness with which administrative health officials put into practice measures for the control of disease based upon the result of research into their cause and method of transmission. This applies not only to the control of diseases after they have assumed undue prevalence in a community but to the prevention of the entrance of diseases into a hitherto non-infected locality. Examples of this delay in the application of laboratory results to practical public health procedures are numerous as shown by the history of the control of yellow fever, malaria, bubonic plague, typhus fever, cholera, and even of typhoid fever, the most studied, and still one of the most prevalent of our endemic infectious diseases. It has been known for at least fifteen years that bubonic plague is primarily a disease of rodents, and only secondarily of man, and that the disease is carried to man by infected fleas. While these facts have been common knowledge even to the laity, they have been practically disregarded by every city in the United States, except sporadically, so far as the putting into effect of measures for the destruction of rats and even of the exclusion of possibly infected rats from places in the United States in which bubonic plague is present. New Orleans in all probability would have avoided the loss of life and the great financial loss to the city and its citizens if it had applied, previous to 1914, those measures known to be effective in plague prevention. What has happened in New Orleans may happen to other cities.

We know that malaria is transmitted by certain mosquitoes and that the reservoir of infection is largely composed of persons without clinical evidences of the disease, yet how many communities in endemic foci of the disease in this country are enforcing scientific anti-malarial measures based upon this knowledge?

We know that honest tuberculin testing of cattle practically insures milk free from tubercle bacilli, and we also know that proper pasteurization of milk saves lives and prevents sickness, yet how few are the localities in

which there is enforced adequate tuberculin testing of milk cattle or efficient pasteurization of the milk supply.

Other examples could be cited even more striking in that they show how slow the administrative branch of public health is to apply to disease prevention the measures so patiently worked out by the research workers as regards the control and prevention of disease, not only of the contagious diseases, but of those other large classes of diseases about which we have been learning so much in the last few years. I, of course, refer to the socalled industrial diseases and diseases of nutrition.

There can be no question as to the importance and desirability of research and it should be encouraged and promoted in every way, but if all research was stopped and application was made of our present knowledge that pertains to the prevention of disease, the death-rate would be cut almost in half.

The Interstate and Intrastate Control of the Milk Supply.

It will be generally conceded that milk is a more important factor in the spread of disease than any other element of our food supply, and that it may even exceed in importance our water supply as a disseminator of disease. We know how frequently milk has been shown to have been responsible for the spread of typhoid fever, septic sore throat and perhaps others: we do not know and cannot even surmise how many thousands have become ill or even lost their lives through untraced infection in the milk. Some states and many municipalities have attempted to control this flood of infection pouring into our towns and cities from the country districts by inspection of dairy farms, and in a few instances by compulsory pasteurization of the greater part of the milk supply. It is familiar to all how unsatisfactory the present system of inspection has proved, and how costly it has been. We see in a state supplying milk to its own cities, and also to cities located in other states, inspectors not only from a number of cities within the state, but inspectors from other states, all traveling back and forth and crossing the track of each other in their travels. This inspection could not only be more efficiently conducted but it could be done far more economically if all of the inspections in a state were done by a corps of inspectors under a single head and working under uniform instructions. The federal government has not up to this time taken a decided part in safeguarding the milk sold in interstate commerce, though there are at least two Bureaus with jurisdiction. The Bureau of Chemistry has authority under the Pure Food & Drug Act, and the Public Health Service under the Interstate Quarantine Act has the power to prevent the shipment in interstate commerce of milk which may convey contagious diseases from one state to another. Under this broad power, the Public Health Service can prevent the shipment of milk from non-tuberculin tested cows and the shipment of milk from localities in which contagious diseases, the in-

fection of which may be transmitted by milk, are prevailing to such an extent as to render possible the spread of those diseases from one state to another. We thus see that this important factor in the spread of some of the contagious diseases—infected milk—may be controlled by the federal government, if the Congress provides the funds, just as the federal government controls the packing industry. For purely intrastate milk shipments the state should control the sanitary quality of the milk until it reaches the city limits. When it reaches the municipality the proper authorities should require that all milk sold should be efficiently pasteurized. There are those who are opposed to pasteurization for one reason or another, as they do not believe that pasteurization can be efficiently enforced, but the value of the procedure as a public health measure cannot any longer be questioned, and the practicability of its enforcement has been conclusively demonstrated in large and small communities.

Morbidity Reports.

There is one factor in public health administration which I wish to dwell upon for a moment because of its importance. I refer to the necessity for health departments having currently at hand accurate information of the prevalence of disease within their respective jurisdiction. If health departments have a purpose it is to prevent and control disease, and this is impossible, no matter what else they may do, or how great appropriations they may expend, if they have not knowledge of when, where, and under what conditions cases of the preventable diseases are occurring. Whenever a serious outbreak of a communicable disease has appeared in modern times in any community and an earnest and intelligent effort has been made to combat the epidemic, the first requirement, and the most rigidly enforced, has been that all cases should be reported. The inference is unavoidable that in those instances where the notification of cases is not insisted upon the efforts at control lack in earnestness and sincerity. Every case of a communicable disease is a focus from which other cases may arise. Every case has its origin in some other focus which should be found. Of the diseases which are preventable, but not communicable, every case shows the existence of conditions which produce the disease, conditions which in most instances must be remedied to prevent similar injury to others and the occurrence of additional cases. Morbidity records are to the health department its chart and compass.

The reports of cases should not be considered as statistics although there is much of statistical value in them. Each report is a notification to the health department that a case of preventable disease has occurred and indicates the location of a focus requiring prompt attention. These reports should, therefore, be received promptly by the epidemiologist or that division having charge of the control of preventable diseases.

There is nothing which can take the place of these reports in showing the prevalence of disease and where it

exists. Disease is as widespread and as prevalent as are cases. Nor can it be any less prevalent or widespread than are cases.

After it has served the current purpose of showing the health department where it must act, the information contained in morbidity reports should be carefully filed and periodically compiled, so that there may be from year to year a record of the prevalence of disease and the conditions under which it occurred. Such records, when accumulated over a period of years, would furnish invaluable information to the epidemiologist and sanitarian. They would show the varying prevalence of disease from year to year and in different localities. They would indicate the cycles of prevalence and the epidemic waves.

Because of the importance of the subject to health departments and the obvious desirability for uniformity in public health laws and regulations of this kind, I wish to bespeak your careful study of the Model State Law for Morbidity Reports, adopted by the Conference of State and Territorial Health Authorities with the United States Public Health Service. This law is intended to be a model, embodying the essential principles of the subject. It was drafted primarily for enactment by the states. With but slight modification, however, it is suitable for enactment as an ordinance by municipalities. The list of diseases given may appear to some to be long, but, logically, in a model law of this nature, all the preventable diseases must be included. The law as adopted by states and cities might, however, be made to include only those preventable diseases over which it was the intention of the health department to exert control. No health officer should be unfamiliar with the provisions of this model law.

Industrial Diseases.

The most important social change which has taken place within the last century is the tremendous development of industry. It is this development which has wrought such changes in man's environment and subjected him to a multitude of health hazards to which he was formerly a stranger.

In view of the constantly increasing numbers of the population who carry on our industries, the question of their health and the risks to which it is exposed is becoming a question of continuously greater national importance. While questions affecting the health of workers must ever constitute a part of the general problem of safeguarding the public health, it is a matter of regret that only in recent years have we begun to accord to it its full share of weight in national health problems. One needs only casually to consult the figures compiled by statisticians to become aware at once of the enormous economic waste which results from preventable illness affecting workers.

This group of the population numbers some 30,000,000 in this country. The average yearly loss for each individual of this group on account of sickness has been approximated at about nine days. This amounts to an annual loss of 740,000 years. In terms of dollars and cents, assuming wages to average $2.00 per diem and medical

care and treatment $1.00, this loss is about $740,000,000.00. At least one half of this can be prevented. In this sum is not included the loss and suffering in the families of industrial workers because of the non-employment of the chief bread winner, nor is there any estimate made of the economic loss because of diminished productivity and curtailment of the year of active work of wage-earners because of the results of previous illness.

Again, statisticians are urgently calling our attention to the great increase which has taken place in the deaths from the so-called degenerative diseases. Figures are at hand which show that the death-rate from such diseases is higher by far among wage-earners than among the inhabitants of rural communities. We are all aware that modern industry has added many stresses to the life of those engaged therein. Long hours, monotony, fatigue, the speeding-up process, exposure to darkness, dampness and extremes of cold and heat, vibration, injurious industrial lights, poisons, fumes, and gases, uncertainty of employment, seasonal fluctuations of the industry, crowded and filthy homes, defective community environment—all multiply the strain upon the human organism so that it is no wonder, if the ravages of communicable diseases are escaped, that these other stresses upon the body produce the effect of throwing many lives upon the human scrap heap of industry, at an age when they should still be at the full tide of their productive powers.

Surely the prevention of industrial diseases, the general improvement of industrial sanitation, and the mitigation of hazards to health inherent in industries is one of the first and most important tasks for the present generation. The end to be accomplished is that industry, per se, shall exert no harmful effects upon the workers engaged therein; that occupation in no industry shall shorten the period of productive activity of the worker. We have heard much of the present safety campaign to diminish industrial hazards. All of our efforts should be directed toward making industry safe in a large sense; safe from every standpoint, from the standpoint of health as well as from accident.

There is, therefore, the necessity for more intensive study of the health conditions surrounding our workers. All progressive manufacturers thoroughly realize that continuous health of workers is a stronger impetus to industrial prosperity than the most efficient automatic machinery and the most improved methods of production. What they desire, however, is specific information, how to make the industries safe from the health standpoint, and effective economic methods to this end. We as sanitarians should be able to furnish them this information. What is needed, therefore, is more intensive study of the sanitary environment of workers and the molding of public opinion toward a demand for their betterment.

Health Insurance.

Investigations into the working and living conditions of the 30,000,000 wage-earners of the United States has revealed many things which are de-

plorable especially among the unskilled low-paid group of workers. In spite of recent improvement in many industrial establishments the fight against insanitary conditions is still an uphill one. Recent sanitary surveys show that the elimination of health hazards from industry is not a thing to be expected in the near future.

Of greater importance is the inability of a considerable proportion of the wage-earners of the country to maintain a healthful standard of living on the wages received. In all investigations the vicious circle of poverty as cause and effect of disease is found.

It is hardly necessary to tell members of this Association that the mortality rates are from two to three times greater among the families of the unskilled low-paid wage-earners than among the families of the well-to-do.

With the highest sick- and death-rate among the groups who are least able to meet the expense, it has become necessary to fix the responsibility for disease-causing conditions and make some provision whereby the responsible parties may meet this responsibility in an adequate and business-like way instead of leaving it to public and private charity.

It has been fairly well determined that three groups, employers, employees and the public are responsible to a varying degree for conditions causing disease among the wage-earning population.

The problem then is to place the burden where it belongs, and from the public health viewpoint, stimulate the coöperation of all concerned to prevent disease. In many European countries the problem has been met by providing for health insurance systems supported and controlled by employers, employees, and the government.

Under these systems medical service together with a continuance of a substantial part of the wages is provided during the sickness of the wage-earner, so that he can afford to stop work when sick without leaving his family destitute. Maternity benefits are provided to conserve the health of the mothers and babies.

The joint contribution to the health insurance funds by the three groups gives to each group a financial incentive to reduce this expense by preventing sickness.

The joint support and control of the funds frees this method of relief from every taint of charity or paternalism and offers a common ground for capital and labor to coöperate for increasing the efficiency of industry and improving the health of the workers.

Just as accident insurance laws may be expected to stimulate a similar campaign for health.

It has not been much more than ten years since the agitation began for workmen's compensation laws (accident insurance), now 34 states and territories have such laws on their statute books. There is every reason to believe that health insurance laws will be the next important step in social legislation. Health insurance bills have already been introduced into three state legislatures and social insurance commissions have been established by two states to study this subject. A bill creating a social in-

surance commission has been favorably reported by the Committee on Labor in the United States House of Representatives.

With the rapid progress in the framing of health insurance laws it is important that the American Public Health Association study this subject and present the best methods of correlating any proposed health insurance system with existing health agencies. At present none of the proposed bills contain any provision for disease-preventing machinery or provision for utilizing existing machinery.

The administration of the medical benefits seem to offer the best method for accomplishing this end. Some such plan has been adopted under the English National Insurance in working out the comprehensive plans for the relief and prevention of tuberculosis in some of the counties and county boroughs.

"To enact a health insurance law simply as a relief measure without adequate prevention features would be a serious mistake, but with a comprehensive plan for disease prevention there is every reason to believe that it would prove to be a measure of extraordinary value in improving the health and efficiency of the wage-earning population."

When we adopt it in this country, let us by all means profit by previous experience, and use such laws as a basis not only for the purpose of relieving illness, but also for preventing it. As the cost of such insurance must be proportional to the incidence of disease, it seems evident that if part of the great funds thus collected are used in a prophylactic way for the purpose of industrial sanitation, the total cost of the insurance must be materially reduced. When, therefore, the question of adopting such laws comes up for discussion in various legislatures, let us as sanitarians demand that the prophylactic side of the question be given thorough consideration, and that the three groups primarily responsible for sanitary conditions affecting workers, namely, the industries, the general public, and the workers themselves, each assume their full share of responsibility in carrying such laws into effect.

HEALTH OF RURAL SCHOOL CHILDREN.

A recent investigation made by the U. S. Public Health Service in connection with studies of rural school children showed that 49.3 per cent. had defective teeth, 21.1 per cent. had two or more missing teeth, and only 16.9 per cent. had had dental attention. Over 14 per cent. never used a tooth-brush, 58.2 per cent. used one occasionally and only 27.4 per cent. used one daily. Defective teeth reduce physical efficiency. Dirty, suppurating, snaggle-toothed mouths are responsible for many cases of heart disease, rheumatism, and other chronic affections. The children are not responsible for the neglected state of their teeth. The ignorant and careless parent is to blame for this condition—a condition which hampers mental and physical growth and puts a permanent handicap on our future citizens. School teachers can and are doing much in inculcating habits of personal cleanliness on the rural school child but this will fail of the highest accomplishment unless parents coöperate heartily and continuously. This is a duty which we owe our children.

THE OCCURRENCE OF LIVING TUBERCLE BACILLI IN RIVER WATER CONTAMINATED BY SEWAGE FROM A HEALTH RESORT.

Drs. Lawrason Brown, S. A. Petroff and F. H. Heise,
Trudeau Sanitarium, Saranac Lake, N. Y.

THERE are many missing links in the etiologic chain in tuberculosis and this paper is the outcome of an attempt to supply from time to time some of these missing links. Several years ago a number of observers claimed that tubercle bacilli occurred in the feces of a large number of patients with pulmonary tuberculosis. We attempted to verify this and Laird and Kite, in the laboratory of the Trudeau Sanatorium, found that the feces contained viable tubercle bacilli in 90 per cent. of all patients with open lesions. We now question if this figure is not too low, for one of us (Petroff) found them in all of thirty-two cases examined and was able to cultivate them, which as far as we know, no one had done before, in 59 per cent. The ease with which guinea pigs could be infected with tubercle bacilli in the feces suggested that a study should be made of water of streams contaminated with sewage. The sewerage system of Saranac Lake at present empties into the Saranac River just below the village. Only four or five small houses in the whole village are not connected with this system. We studied the surface and deeper waters, and in some instances the mud, above and at the outlet of the sewer and at different distances down stream (200 yards, 400 yards, 2.9 miles—measured along a road which does not closely parallel the river,—3.5 and 12 miles). These distances were determined by the occurrence of bridges across the river.

The flow of the stream was estimated to be about 2 to 4 miles per hour.

The Technic.

Large bottles were used to collect the water at the outlet of the sewer. To obtain the water at different levels the covering of the mouth of the bottle was left in place until the bottle was immersed to that level.

Further down the river a different method was used for studying the surface contamination. Strips or bags of sterile cheesecloth were attached to wires and stretched across the surface of the stream and allowed to remain in position from one to two hours, when they were put into sterile covered pails and carried to the laboratory.

The cloth was very carefully washed in sterile water. The wash water was then put into wide mouthed bottles, saturated with NaCl and let stand in the dark for several hours. At the end of that time the scum was collected with sterile spoons and transferred to 50 cc. centrifugal tubes. Ten cc. of normal NaOH was added to each tube which was incubated at 37° for one-half hour. The contents of the tubes were then neutralized with normal HCl, centrifugalized, and part

of this sediment was studied microscopically, part inoculated into egg media, and part injected into guinea pigs.

The Cultures.

All the cultures were contaminated, due very likely to the presence of many moulds and spore-forming organisms in the river water. At this time the gentian violet media (Petroff) was not in use.

The Microscopic Study.

Every smear preparation but three, taken from below the surface, from the outlet of the sewer to a point 3.5 miles down stream, showed the presence of acid-fast organisms. No acid-fast organisms were found above the outlet or 12 miles below the outlet.

The Inoculation of Guinea Pigs.

Our work upon the feces does not incline us to believe that acid-fast organisms other than tubercle bacilli occur frequently in the feces of tuberculous patients, for under certain conditions we have been able to infect guinea pigs in nearly every instance where we found acid-fast organisms in the feces of tuberculous patients. It will be noted from the table that acid-fast organisms occurred in most of the specimens, less often deep in the water than upon the surface as far at least as 3.5 miles from the mouth of the sewer. Unfortunately the next point at which we judged we could study the water was at least 12 miles below the sewer's outlet. Here no acid-fast organisms were found, but colon bacilli occurred in small numbers. We believe these acid-fast organisms are tubercle bacilli, for from the sewer's mouth to a distance of at least 3 miles down stream these acid-fast organisms were capable of producing tuberculosis in guinea pigs, when the sun was not shining. On sunny days the acid-fast organisms when obtained 2.9 miles down stream produced no tuberculosis. Where we could discover no particles of feces in the water we found no viable tubercle bacilli.

The water above the outlet contained no acid-fast organisms on smear.

It should be noted that Jessen and Rabinowitch at Davos found tubercle bacilli only 100 meters below the outlet of the sewer.*

Sample 1. From deep water at mouth of sewer. 25–vi–14, 9.30 a. m., Sunny.
Slides: Positive, numerous acid-fast organisms.
Cultures: Contaminated.
Guinea Pigs: A and B.
Autopsy: Sept. 15, 1914, killed.
Inguinal glands very much enlarged, abscess at seat of inoculation. Many tubercles in the liver and spleen, few in the lungs: bronchial glands very much enlarged. Smears from spleen and liver positive to acid-fast organisms.

Sample 2. From surface water at mouth of sewer. 25–vi–14, 9.30 a. m., Sunny.
Slides: Positive for acid-fast organisms.
Cultures: Contaminated.
Guinea Pigs: A and B.
Autopsy: A died July 31.
Organs congested; bronchial glands enlarged; smear of suspected parts negative to tubercle bacilli.
Autopsy: B killed Sept. 15, 1914.
Spleen very much enlarged and granular; inguinal glands very much enlarged, liver enlarged, containing many tubercles. Bronchial glands very much enlarged. Smears from the suspected parts showed many acid-fast organisms.

*Zeit fur Tub., 1910; XVI, 275.

Distance from sewer mouth.	Location of sample.			Date and time.	Acid-fast organisms	Guinea pigs.	Cultures contaminated.
	Surface.	Deep.	Mud.				
Mouth.....	..	+	..	25–vi–14, 9.30 a.m., Sunny	++	A. Tub. B. Tub.	+
Mouth.....	+	..	..	25–vi–14, 9.30 a.m., Sunny	++	A. Died. B. Tub.	+
Down stream 200 yards.	+	..	..	25–vi–14, 10 a. m., Sunny	+	A. Tub. B. Tub.	+
400 yards...	+	..	..	25–vi–14, 10 a. m., Sunny	+	A. Tub. B. Tub.	+
400 yards...	..	+	..	25–vi–14, 10.30 a. m., Sunny	+	A. Tub. B. Non-Tub.	+
2.9 miles ...	+	..	..	1–viii–14, 10 a. m., Cloudy	+ Pus cells	A. Lost. B. Tub.	+
2.9 miles ...	..	+	..	1–viii–14, 10 a. m., Cloudy	0	A. Non-Tub. B. Non-Tub.	+
3.5 miles ...	+	..	..	1–viii–14, 10.30 a. m., Cloudy	+	A. Non-Tub. B. Non-Tub.	+
3.5 miles ...	..	+	..	1–viii–14, 10.30 a. m., Cloudy	0	A. Non-Tub. B. Non-Tub.	+
2.9 miles ...	+	..	..	25–ix–14, 9.30 a. m., Cloudy	+	A. Tub. B. Tub.	+
3.5 miles ...	+	..	..	25–ix–14, 10.30 a. m., Cloudy	+	A. Non-Tub. B. Non-Tub.	+
2.9 miles ...	+	..	..	6–vii–15, 9.30 a. m., Sunny	+	A. Non-Tub. B. Non-Tub.	+
2.9 miles ...	..	..	+	6–vii–15, 9.30 a. m., Sunny	+	A. Non-Tub. B. Non-Tub.	+
3.5 miles ...	+	..	..	6–vii–15, 10 a. m., Sunny	+	A. Non-Tub. B. Non-Tub.	+
3.5 miles ...	..	..	+	6–vii–15, 10.30 a. m., Sunny	+	A. Non-Tub. B. Non-Tub.	+
12 miles ...	+	..	..	12–iv–16, 45 min.	0	A. Non-Tub. B. Non-Tub.	Cultures negative
Above outlet	+	..	..	13–iv–16, 1 hour	0	A. Non-Tub. B. Non-Tub.	
2.9 miles ...	+	..	..	29–vi–16, 9.30 a. m., Cloudy	+	A. App. Norm. B. App. Norm. C. Tub.	..
3.5 miles ...	+	..	..	29–vi–16, 9.30 a. m., Cloudy	0	D. App. Norm. E. App. Norm. F. App. Norm.	..

SAMPLE 3. From surface 200 yards down stream 25–vi–14, 10 a. m., Sunny.
Slides: Positive for acid-fast organisms.
Cultures: Contaminated.
Guinea Pigs: A and B.
Autopsy: A killed Sept. 15, 1914.
Right inguinal gland size of a large pea, containing thick pus (slide and tubes made). Spleen enlarged and nodular, full of small tubercles. Slide shows gland positive and spleen negative for acid-fast organisms.
Autopsy: B killed Sept. 15, 1914.
Right inguinal gland size of a large pea, containing thick pus (slide and tubes made). Spleen enlarged and nodular, full of small tubercles. Slide showed gland positive and spleen negative, for acid-fast organisms.

SAMPLE 4. From surface 400 yards down stream. 25–vi–14, 9.50 a. m., Sunny.
Slides: Positive for acid-fast organisms.
Cultures: Contaminated.
Guinea Pigs: A and B.
Autopsy: A killed Sept. 15, 1914.
Sup. inguinal glands enlarged; spleen enlarged and nodular; few tubercles. Slide showed gland positive for acid-fast organisms.
Autopsy: B.
Sup. inguinal glands enlarged; spleen enlarged and nodular. Slide showed gland and spleen positive for acid-fast organisms.

SAMPLE 5. From deep water 400 yards down stream. 25–vi–14, 10.30 a. m., Sunny.
Slides: Positive for acid-fast organisms.
Cultures: Contaminated.
Guinea Pigs: A and B.
Autopsy: Killed Sept. 15, 1914.
A: Inguinal glands slightly enlarged, spleen slightly enlarged but not nodular, lung apparently normal, liver normal. Smears showed only few acid-fast organisms.
B: Inguinal glands slightly enlarged, lung and liver normal, no acid-fast organisms on the smears.

SAMPLE 6. From surface 2.9 miles down stream. 1–viii–14, 10 a. m., Cloudy.
Slides: Positive for acid-fast organisms; some pus cells.
Cultures: Contaminated.
Guinea Pigs: A and B. A was lost.
Autopsy: B killed Sept. 22, 1914.
Inguinal glands very much enlarged; spleen enlarged and nodular; few tubercles in liver; lungs apparently normal; bronchial glands very much enlarged; spleen, liver and glands showed numerous acid-fast organisms.

SAMPLE 7. From deep water 2.9 miles down stream. 1–viii–14, 10 a. m., Cloudy.
Slides: Negative for acid-fast organisms.
Cultures: Contaminated.
Guinea Pigs: A and B.
Autopsy: Killed Sept. 22, 1914.
Apparently normal with the exception of the bronchial glands which were slightly enlarged. Smear preparation showed no acid-fast organisms.

SAMPLE 8. From surface 3.5 miles down stream. 1–viii–14, 10.30 a. m., Cloudy.
Slides: Positive for acid-fast organisms.
Cultures: Contaminated.
Guinea Pigs: A and B.
Autopsy: Sept. 22, 1914.
A: Inguinal glands appeared to be slightly enlarged; spleen, liver and lung normal; glands were mashed but no acid-fast organisms found.
B: Apparently normal. No acid-fast organisms found.

SAMPLE 9. From deep water 3.5 miles down stream. 1–viii–14, 10.30 a. m., Cloudy.
Slides: No acid-fast organisms.
Cultures: Contaminated.
Guinea Pigs: A and C.
Autopsy: Sept. 22, 1914.
A: Apparently normal.
C: Apparently normal.

SAMPLE 10. From surface water 2.9 miles down stream. 25–ix–14, 10 a. m., Cloudy.
Slides: Positive for acid-fast organisms.
Cultures: Contaminated.
Guinea Pigs: A and B.
Autopsy: Killed Nov. 2, 1914.
A: Superficial inguinal glands slightly enlarged; spleen very much enlarged and nodular; few tubercles in lung and liver; smears positive for acid-fast organisms.

B: Superficial inguinal glands slightly enlarged; spleen slightly enlarged but not nodular; lungs apparently normal. Smears showed few acid-fast organisms.

SAMPLE 11. From surface 3.5 miles down stream. 25-ix-14, 10.30 a. m., Cloudy.
Slides: Positive for acid-fast organisms.
Cultures: Contaminated.
Guinea Pigs: A and B.
Autopsy: Killed Nov. 2, 1914.
A: Abscess at seat of injection. No tuberculosis.
B: No tuberculosis.

SAMPLE 12. From surface 2.9 miles down stream. 6-vii-15, 9.30 a. m., Sunny.
Slides: Positive for acid-fast organisms.
Cultures: Contaminated.
Guinea Pigs: A and B.
Autopsy: Killed Oct. 2, 1915.
A: Apparently normal.
B: Apparently normal.

SAMPLE 13. From mud 2.9 miles down stream. 6-vii-15, 9.30 a. m., Sunny.
Slides: Positive for acid-fast organisms.
Cultures: Contaminated.
Guinea Pigs: A and B.
Autopsy: Killed Oct. 2, 1915.
A: Apparently normal.
B: Apparently normal.

SAMPLE 14. From surface 3.5 miles down stream. 6-vii-15, 10 a. m., Sunny.
Slides: Positive for acid-fast organisms.
Cultures: Contaminated.
Guinea Pigs: A and B.
Autopsy: Killed Oct. 2, 1915.
A: Apparently normal.
B: Apparently normal.

SAMPLE 15. From mud 3.5 miles down stream. 6-vii-15, 10 a. m., Sunny.
Slides: Positive for acid-fast organisms.
Cultures: Contaminated.
Guinea Pigs: A and B.
Autopsy: Killed Oct. 2, 1915.
A: Apparently normal.
B: Apparently normal.

SAMPLE 16. From surface 12 miles down stream. Collected 45 min., 12-iv-16.
Slides: Negative for acid-fast organisms.
Cultures: Negative.
Guinea Pigs: A and B.
Autopsy: June 1916.
Lungs, liver, spleen and glands apparently normal. (A and B.)

SAMPLE 17. Above outlet of sewer. Collected 1 hour. Surface. 13-iv-16.
Slides: Negative for acid-fast organisms.
Cultures: Negative.
Guinea Pigs A and B.
Autopsy: June 7, 1916.
Lungs, liver, spleen and glands apparently normal. (A and B.)

SAMPLE 18. From surface 2.9 miles down stream. 29-vi-16, 9.30 a. m., Cloudy.
Slides: Positive for acid-fast organisms.
Guinea Pigs: A, B and C.
Autopsy: August 14, 1916.
A. Apparently normal.
B. Apparently normal.
C. Superficial inguinal glands enlarged, spleen enlarged and nodular, superficial glands enlarged, bronchial glands slightly enlarged, Acid-fast organisms demonstrated on the smears from the spleen and not from the glands. Lungs and liver apparently normal.

SAMPLE 19. From surface 3.5 miles down stream. 29-vi-16, 9.30 a. m., Cloudy.
Slides: Negative.
Guinea Pigs: D, E and F.
Autopsy: August 14, 1916.
D. Apparently normal.
E. Apparently normal.
F. Apparently normal.

STANDARDS OF MECHANICAL FILTRATION PLANT PERFORMANCE.*

ABEL WOLMAN,
Resident Engineer, Northern District, Maryland State Department of Health.

The standards suggested in this paper are the result of a study of the operation of filtration plants in Maryland upon which the writer was detailed under the general direction of Mr. R. B. Morse, Chief Engineer, Maryland State Department of Health. Acknowledgment is given here both to him and the writer's brother, Dr. Leo Wolman, for helpful criticism of the various statistical problems involved in the discussion.

IN THE past, discussions of the sanitary quality of a potable water have been based upon definitions of absolute standards of quality. For instance, the Imperial Board of Health of Germany issued in 1894 the manifesto that the number of water bacteria which should appear in a filtrate should not be more than 100 per cc. Stein,† on the other hand, would allow as much as 200 per cc. on a 20° C. count for large turbid rivers. Thresh‡ would demand a filtrate uniformly containing less than 100 per cc. Some of the more radical filtration plant operators go so far as to demand no standard as to number, but determine the quality of the water simply by the kind of bacteria.

The objection to all such absolute standards as above seems to lie in the fact that no attempt has been made to justify them by the application of practical tests. With the increasingly large number of mechanical filtration plants in the United States, any hypothetical, arbitrary standard for pure water is of little practical value, since the problem turns rather upon the question of what the filtration plants can do than of what they should do. An investigation of the analyses of effluent samples of typical plants throughout the country would, therefore, elicit this practical, rather than arbitrary, standard. If this practical standard, in turn, should meet the demands of operators and sanitarians from the point of view of hygienic quality, we shall then be in a position to announce a standard, based upon practical performance, which every filtration plant might be expected to meet.

The measure which we are to seek must perform two functions. It must measure the efficiency of the plant from the point of view of the removal of general bacteria and its magnitude must be such as to warrant the assumption that the effluent from any plant meeting this standard is of undoubtedly good character. It is quite obvious that the method still in vogue of comparing actual number of bacteria in the raw water with that in the effluent (counts at 20° C.) and using

* Received for Publication, September 18, 1916.

† Water Purification Plants And Their Operation, 1915.

‡ Examination of Waters and Water Supplies, 1913.

the percentage of removal as a test of the efficiency of the process of filtration, leaves much to be desired. With a large number of bacteria in the raw water, a high efficiency is frequently attained while the effluent is entirely unsatisfactory from a hygienic standpoint; whereas with water of a low bacterial content a low efficiency would result no matter what the state of the effluent is. The fallacy in the use of this method of calculation lies in the fact that the efficiency of a plant does not, as is assumed, vary directly with the percentage reduction in the number of bacteria. The plant which reduces a raw water count of 50,000 per cc. to 500 per cc. apparently is as efficient as one reducing 5,000 to 50 per cc., both having a percentage removal of 99. In the first case, however, the effluent is manifestly poor and in the second relatively good. Many examples can be quoted of plants having total bacterial efficiencies of 99 per cent. and yet having effluents varying from 5 to 500 per cc.

As the writer has indicated above, the objection to such methods is due to the fact that real efficiencies do not increase as rapidly as do the actual numbers of bacteria in raw waters. In other words, a more accurate measure of bacterial removal is one in which the increases in absolute numbers are modified by the substitution of data that vary with these numbers but do not increase with the same rapidity. It is a well known fact that the logarithms of numbers fulfill this requirement, since they do not increase as rapidly as do the numbers themselves. The substitution of logarithms* for the numbers of raw water and effluent bacteria and the calculation of the ratio of these logarithms should for these reasons give a more satisfactory measure than that now in use. To illustrate, using the figures quoted above:

Plant A—Raw Water = 5,000; Effluent = 50; Efficiency = 99 per cent.
Plant B—Raw Water = 50,000; Effluent = 500; Efficiency = 99 per cent.

In Plant A the logarithm of 5,000 is equal to 3.7, while that of 50 equals 1.7. Taking the ratio of these two we have a value of 2.2. In Plant B, the logarithm of 50,000 equals 4.7, of 500, 2.7. The ratio of these is 1.7. It is evident from this relation that Plant B is not performing as efficiently as Plant A. The old measure of efficiency of both, 99, shows no such conclusion. It is the writer's purpose, therefore, to illustrate the application of the above method in calculating efficiencies of a number of plants throughout the country, and then to make use of the same in the subsequent discussion. For the sake of clearness, he will hereafter refer to the above ratio of logarithms of raw water and effluent counts as the "coefficient of efficiency."

In order to obtain sufficient data for a study of filtration plant performance, operating results were obtained from various plants throughout the country. In Tables I and II the results obtained have been classified. Table I gives the bacterial counts

* Note: This particular application of logarithms was suggested to the writer by Dr. Leo Wolman, Department of Economics, University of Michigan.

TABLE I.

STATISTICS OF OPERATION OF VARIOUS RAPID SAND FILTRATION PLANTS.

Bacterial count.							
Raw water.				Plant effluent.			
20°.		37°.		20°.		37°.	
Mean.	Max.	Mean.	Max.	Mean.	Max.	Mean.	Max.
		156	1,280			6	500
2,122	32,000			7	22		
2,051	38,000			5	20		
2,968	9,600			41	101		
16,500	100,000+			36	250+		
		400	10,000			0	
		†				†	
8,027	100,000+			24	250		
6,951	148,000			39	430		
		1,332	7,300			3	17
12,460	130,000	1,600	15,900	42	2,080	11	520
350	70,000			6	43		
		77	1,100			2	30
3,451	15,500			24	84		
1,811	40,250	121		3	60	1	
2,868	21,500			19	520		
2,517	22,500			17	435		
		1,714	2,600			7	160
		800	5,000			4	10
		3,894*				18	
1,575	74,200			6	150		
9,284	260,000			30	290		
1,700	6,900			5	30		
		724	2,631			19	89
10,541	75,000			34	900		
47,189	330,000			289	4,800		

* Not under laboratory control.
† No record.

of raw water, filter, and disinfected effluents. Table II contains a tabulation of the coefficients of efficiency under varying conditions of counts. For purposes of discussion the coefficients of efficiency, based on mean counts at 20° C., will be used, since most of the plants have apparently used these counts. As is noted on the heading of Table II, these coefficients have been calculated upon the basis of raw water and final effluent, whether disinfected or not, so as to represent a measure of efficiency of the entire

TABLE II.

STATISTICS OF OPERATION OF VARIOUS RAPID SAND FILTRATION PLANTS.

Coefficient of efficiency—raw to final effluent.

Mean count—20°.	Mean count—37°.
	2.81
3.92	
4.73	
2.17	
2.71	
	*
†	†
2.83	
2.42	
	6.94
2.53	3.08
3.26	
	6.29
2.56	
6.80	*
2.70	
2.77	
	3.81
	4.84
	2.87
4.10	
2.68	
4.64	
	2.23
2.61	
1.90	

* Infinity—Effluent = 1 or 0, hence log. = 0; therefore coefficient = infinity.

† No record.

plant. The application of the coefficient can, of course, be extended to the measurement of individual phases of operation within the plant itself, as the writer will later illustrate.

After making an examination of the data tabulated in the above tables, it becomes clear what standard of efficiency may be reasonably demanded of mechanical filtration plants. This standard is suggested in the following:

No mechanical filtration plant should be considered as operating efficiently, unless a coefficient of efficiency of at least 2.5 (based on mean counts of raw water and final effluent at 20° C.) is consistently obtained. This, of course, is modified by the following:

As a corollary to this it should be stated that a plant obtaining on an average less than 2.5, is either working inefficiently or else the bacterial content of the raw water is comparatively low.

Let us now test these requirements by an example: If a raw water contains 100,000 bacteria per cc., the effluent must contain no more than 100 per cc., in order to maintain a coefficient of efficiency of 2.5. If the raw water should contain 1,000 per cc. and the effluent 16, or the raw water 500 and the effluent 12, the coefficient would still be 2.5. However, if the bacterial counts were 100 and 10, for the raw and filtered water respectively, the coefficient of efficiency would be only 2.0. But in this case the bacterial count in the untreated water is low and, considered from this one point of view alone filtration is not needed.

That the filtration plants of this country should meet this requirement, except under extraordinary conditions, is indicated by the fact that almost all of those of which the writer has record can and do meet it. Within the limit of raw water count suggested above, a coefficient of 2.5 does not seem to be too high. So far as the

writer is aware, no mechanical filtration plant for a public water supply has to deal with water averaging anywhere near 100,000 bacteria per cc.

It should also be noted that any coefficient below 1.0 would indicate that the plant is producing an effluent worse in bacterial content than the raw water.

One advantage of the coefficient of efficiency evidently lies in the fact that it is not as much influenced by great numerical increases in bacteria as is the percentage removal measure, based on actual counts. A far more important advantage, too, is that the influence of great increases in counts in effluent samples is greater than those in raw water samples since the logarithms of small numbers increase more rapidly than those of large. This should be so, since, in the past, no mathematical cognizance of sufficient weight has been taken of the filter effluent count—which after all is of prime importance in estimating the operating efficiency of the works. This comparison of coefficients of efficiency and actual percentage removal is well illustrated in the following table of results of a plant in Maryland (Table III).

The month of December, 1915, for instance, shows a percentage efficiency greater than that of November. The average effluent count is, however, higher. The coefficient of efficiency, on the other hand, gives a more accurate picture of the work of the plant from the point of view of the sanitarian, since November shows a higher coefficient than December. It is interesting to note, also, that practically

TABLE III.

COMPARISON OF COEFFICIENTS OF EFFICIENCY WITH PERCENTAGE REMOVAL OF BACTERIA ON THE BASIS OF AVERAGE COUNTS AT 20° C.

	Coefficient of efficiency.	Percentage removal efficiency.
1915.		
October		
Raw—10,842		
Eff. — 48	2.39	99.557
November		
Raw—1,009		
Eff. — 4	5.00	99.604
December		
Raw—19,771		
Eff. — 52	2.50	99.737
1916.		
January		
Raw—33,150		
Eff. — 198	1.97	99.403
February		
Raw—64,100		
Eff. — 136	2.26	99.788
March		
Raw—80,368		
Eff. — 592	1.77	99.263
April		
Raw—55,056		
Eff. — 196	2.07	99.644
May		
Raw—3,270		
Eff. — 325	1.40	90.061
October 1—December 31, 1915 and January 1—May 31, 1916.		
1915.		
Raw—10,541		
Eff. — 34	2.61	99.677
1916.		
Raw—47,189		
Eff. — 289	1.90	99.388

each month this plant showed a removal of over 99 per cent., even though the effluents varied in count from 4 to 592 per cc. It is plainly obvious from the above table that the coefficient of efficiency follows more sensitively than the percentage removal the true performance of the works.

Together with a standard for bacterial counts, there must be also at hand some standard to determine the allowable frequency of bacilli coli in the plant effluent. In determining this standard, the same method as used above was followed, that is, an empirical rather than arbitrary standard was sought. Presumptive, rather than isolation, tests were used, because most of the plants, for which records are available, do not attempt to isolate and because, for purposes of comparison only, it is unimportant whether the isolations are a low or high percentage of presumptives. This is particularly true, since similar conditions are being compared and any error which would occur would affect the results of each plant in the same way. Practically all of the plants used hypochlorite or liquid chlorine. The academic question as to whether B. coli are actually isolated in any one plant is important for any absolute guarantee of the purity of the effluent, but in a measure of the operation of a plant a comparative standard is for practical purposes sufficient. Such a standard based upon presumptive tests only is, therefore, warranted. An examination of Table IV indicates that the range of coli in 1 cc., in raw waters at various plants, varies from 60 per cent. to 100 per cent. of all samples. A further study of this same table discloses the fact that a majority of the plants listed can obtain an effluent showing colon present by presumptive test in 10 cc. in less than 10 per cent. and in 1 cc. in not more than 2 per cent. of the samples. A number of the plants obtain much better results than these. The above data show fairly well that there is a degree of uniformity in the presence of colon in the raw water of all plants. As a measure of the efficiency of the plant, from the point of view of colon removal, the following standard is suggested:

That the percentage of samples showing colon present in the effluent of a mechanical filtration plant by presumptive tests shall not exceed 10 per cent. in 10 cc., nor 2 per cent. in 1 cc.

In interpreting daily B. coli results at any plant, it has been found, too, that no satisfactory measure exists to determine the relative efficiencies of colon removal of various stages of operation. If a raw water containing B. coli in 0.01 cc. passed through the coagulating basin and entered the filter beds with colon present in 0.1 cc. and finally left the filters with colon in only 1 cc., we had no measure of the changes taking place, so as to compare individual stages of operation on successive days. The method of Phelps, of using the reciprocal of the greatest dilution giving a positive test as the actual number of B. coli present, is of value in determining the absolute quality of effluents at various stages, but for comparisons within the plant it has objections which the writer will attempt to make clear. Using the

TABLE IV.

STATISTICS OF OPERATION OF VARIOUS RAPID SAND FILTRATION PLANTS.

Colon bacillus—per cent. of tests positive.

Raw water.								Plant effluent.			
Presumptive.				Isolation.				Presumptive.		Isolation.	
10.	1.	0.1.	0.01.	10.	1.	0.1.	0.01.	10.	1.	10.	1.
100	100							0	0		
	64*								0.54*		
	87.5								1.88		
	90	46.4	10.6						1.08		
91	77							0	0		
								7.4	0		
	88.8	63.9	6.0					22.7	6.27		
							‖				
100	91							17.0	0		
		87.0						26.3	3.20		
							‖				
	90.2	45.3			81.0	37.0		7.7	0.50	6.0	0.20
86.8								0.27			
	48.9								1.22		
	30.8								0.64		
	23.8								0.21		
	92.0							4.0			
99	85.0							†		†	
	‡99.1	78.0						30.5	6.40		
	36.3								0		
100	87.6							3.09	.9		
					86.0					3.4	0
	§98.0									16.4	4.3
100	91.0	46.0	16.6	69.0	54.0	30.3	7.1	50.0	2.0	4.0	2.0
100	72.0	32.0	12.6	76.2	50.4	22.2	7.2	68.6	10.6	15.2	5.8

* Average for 7½ years. † Less than 1.00. ‡ Not under laboratory control. § In 0.5 cc. ‖ No record.

example quoted above, we have the following, by Phelps' method: Raw water = 100 B. coli per cc., coag. basin effluent = 10 per cc., filter effluent = 1 per cc. By the percentage method the removals are as follows: Coag. basin = 90 per cent., filter effluent = 90 per cent.; Tot. plant = 99 per cent. If on the second day the raw water conditions were the same and the filter effluent showed B. coli in 10 cc., the efficiency of the entire plant would be 99.9 per cent. The percentage method, in other words, places too great emphasis upon low degrees of colon removal. The measure which the writer will venture to suggest, has for its object the comparison of the

CHART I.

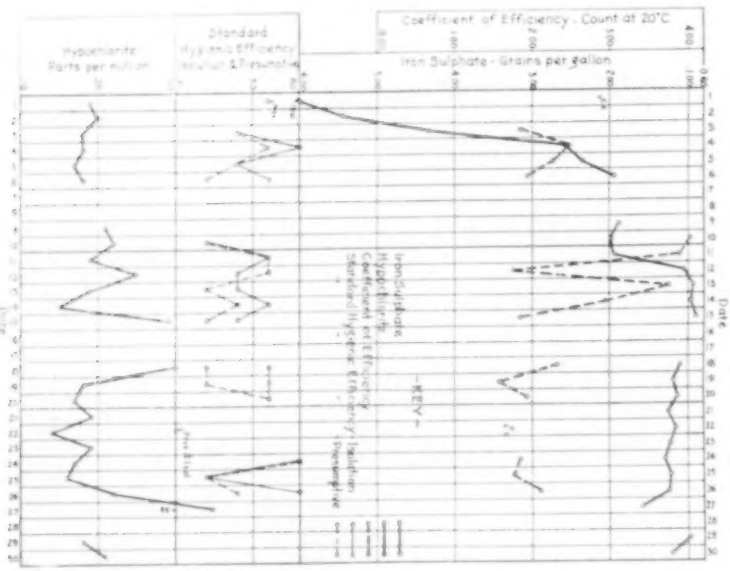
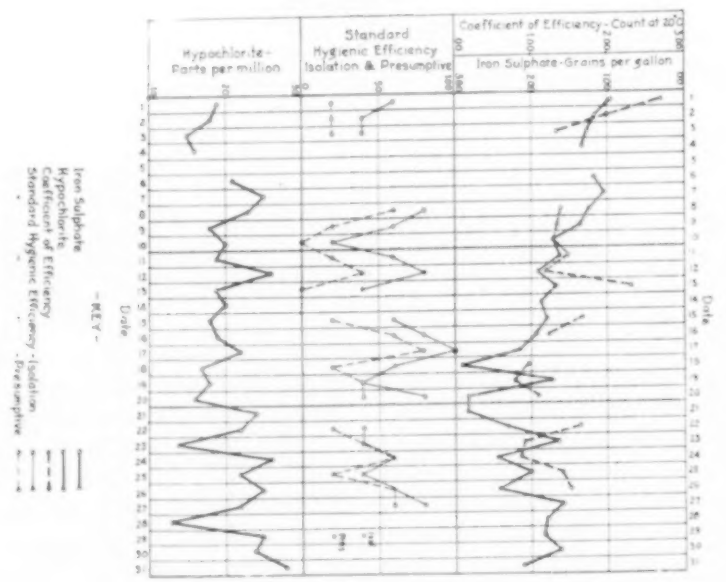


CHART II.



successive steps of colon removal, rather than of actual quantities of B. coli. For this purpose a "Standard Hygienic Efficiency" has been arbitrarily assumed as 100 per cent. when there are removed from a raw water showing positive presumptive or isolation tests for colon in 0.01 cc. sufficient bacilli to produce an effluent showing negative presumptive or isolation tests, as the case may be, in 100 cc. The following table has been devised for uses as above outlined:

Colon present in			
Raw water	+ 0.01	20%	100% Standard Hygienic Efficiency, when raw water is positive in 0.01 and effluent is negative in 100 cc. Each intermediate step = 20% S. H. E.
	+ 0.1	20%	
	+ 1.0	20%	
	+ 10	20%	
	+100	20%	
Plant Eff.	−100	20%	

By the percentage method, using Phelps' system, this table would be

Raw water	+ 0.01	90%	= 100% (minus)
	+ 0.1	90%	
	+ 1.0	90%	
	+ 10	90%	
	+100	90%	
Plant Eff.	−100	90%	

That is, less than 10 per cent. absolute difference exists between any one step in this process and the entire process. Inasmuch as it is not yet established just what relative difficulty of filtration is encountered in each step, it is only fair to assume an equal efficiency for each successive step of colon removal.

Example:

(1) Raw water = B. coli in 0.1 cc.
Plant Effluent = B. coli in 100 cc.
Standard Hygienic Efficiency = 60%
Efficiency by Phelps method = 99.9%

(2) Raw water = B. coli in 0.01 cc.
Plant Effluent = B. coli in 100 cc.
Standard Hygienic Efficiency = 80%
Efficiency by Phelps Method = 99.99%

The writer wishes to reiterate here that the Standard Hygienic Efficiency is of use only in the interpretation of data within the plant or in comparison with other plants and not as a measure of the sanitary quality of the effluent. For the latter purpose, the judicious use of the coefficient of efficiency combined with Phelps' method of estimating B. coli gives all that is desired within practical limits.

The application of the S. H. E. to the solution of practical problems in filtration is illustrated in Charts I and II. Here comparisons are made, for successive days, between S. H. E. coefficients of efficiency, and various doses of a plant in Maryland. The advantage of the measures used over the former percentage methods is clear when it is realized that, by the old system, almost all the total removals would be in the neighborhood of 99 per cent., and most of the colon removals indistinguishable from one another.

◆

Private opinion is weak, but public opinion is almost omnipotent. A single snowflake—who cares for that? But a whole day of snowflakes, drifting over everything, obliterating landmarks, and gathering on the mountains to crash in avalanches—who does not care for that?

—H. W. Beecher.—*Ex.*

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THE CINCINNATI MEETINGS.

The forty-fourth annual meeting of the American Public Health Association was held in Cincinnati, Ohio, from October 24 to 27. The attendance was large, in fact being second only to the record meeting in Rochester the previous year.

Those who were present at Symphony Concert on Tuesday night will long remember that splendid and dignified occasion. President John F. Anderson's address was delivered at this time and makes a worthy addition to the long list of presidential addresses. Doctor Anderson, whose address is published in this issue, devotes some space to the affairs of the Association. Notable is his suggestion that the number of sections in the Association should be added to in order to make room for the ever increasing numbers of specialists in the domains of sanitary science. In connection with this, petitions were presented asking for the formation of sections dealing with food and drug control and with educational hygiene. These petitions were referred to the Executive Committee by the Board of Directors with the recommendation that they be granted and the new sections created.

Doctor Anderson particularly emphasizes the problems of industrial hygiene. Problems created by the tremendous development of industry, of appalling magnitude and hardly yet touched by the sanitary profession. Incidentally the Section on Industrial Hygiene held very interesting sessions. Their program was characterized by a prominent expert in this field as being the best program on the subject yet presented in this country.

Space prohibits references to many of the important matters considered at both General Sessions and section meetings, but readers of the JOURNAL are assured of much interesting and valuable matter in subsequent issues of the

JOURNAL. Suffice it to say that there was great evidence of the spirit and earnestness of the health workers present, a solidarity which means much for the noble work of life preservation.

The Association was happy to welcome two of its Mexican members, Dr. Jesus Monjaras and Dr. Manuel Iglesias who came at great difficulty and personal sacrifice. The local committee, headed by Dr. John H. Landis, received and deserved the thanks of all present for the splendid arrangements that made it possible for the meetings to be so successful in every manner.

RESOLUTIONS ADOPTED BY THE AMERICAN PUBLIC HEALTH ASSOCIATION.

Resolved, that the American Public Health Association endorses the principle that manufacturers of all patent medicines be required to file the formulæ of all such preparations with the Bureau of Chemistry, Department of Agriculture, and with other proper state and municipal authorities in the United States and with the proper authorities in Canada, Mexico and Cuba.

WHEREAS, United States Senate Bill 4086, providing for the establishment of a national leprosarium and the more humane care of lepers than is possible under state and municipal administration, on account of the exceptional nature of the disease, and,

WHEREAS, said bill has been favorably reported by the Senate Committee on Public Health and National Quarantine,

Be it resolved, by the American Public Health Association in Annual Meeting assembled, that we most heartily and unanimously approve of the principle of this bill and respectfully recommend its early enactment into law as a measure called for by the highest considerations of public policy and the welfare and needs of those concerned.

Be it resolved, that the Chair appoint a Permanent Committee of five on Professional Education for Public Health Work, the term of one member shall expire each year, and his successor shall be appointed for a term of five years. The duties of the committee shall include a standardization of the courses in this field, both in medical schools and those schools training professional public health workers. It should be the aim of this committee to coöperate with the Council on Medical Education of the American Medical Association and the Association of American Medical Colleges in order to secure universal adoption of such standardized courses and an increase of the amount of attention paid the subject. The committee should also work towards a uniformity in the degrees or other awards conferred upon candidates at the successful completion of professional courses for public health workers.

TUBERCULOSIS AMONG PROSTITUTES: REPORT OF AN INVESTIGATION MADE IN CONNECTION WITH A STUDY OF THE DISEASE IN CINCINNATI, OHIO.

D. E. Robinson and J. G. Wilson,
U. S. Public Health Service.

IN CONNECTION with an investigation of tuberculosis made in Cincinnati, Ohio, by the writers for the purpose of determining the predisposing causes of the high death-rate from tuberculosis in that city,* a survey of the disease among prostitutes was also made. This survey was undertaken, not so much with the idea of ascertaining the danger to those living this life in regard to tuberculosis, but with a view of determining how great a public menace tuberculosis among prostitutes presents. There can be no question that a prostitute who is an open case of tuberculosis may be the means of transmitting the infection to many others. When it is remembered that one prostitute will often have as many as 25 or even more patrons in one night, the danger from this source is admittedly great.

It may be argued that those who frequent these places do so at their own peril and deserve no better fate than to contract a disease which will later cause death or a life of misery, but this does not alter the fact that the prostitute may be the original source of an infection which may later be transmitted to many other persons.

The study by Irwin of tuberculosis among prostitutes in Philadelphia and Atlantic City† showed an enormous amount of the disease among this class of women, as he found 82 tuberculous out of a total of 218 examined.

Our survey in Cincinnati has not shown anything near such a high percentage of tuberculosis. There are good reasons for this discrepancy in results, among which those of greatest significance are, first, that the women examined by Irwin included street-walkers, as well as the women in houses, and second, and most important, that a very strict surveillance is maintained over this class of women in Cincinnati. Each one is required to have in her possession a medical certificate from a reputable physician stating that she is not suffering with any form of venereal disease and this certificate must be renewed each week. Any woman found by the police without such certificate is arrested and taken to the City Hospital for examination and detention, in the event venereal disease is found. This weekly medical examination naturally tends to preserve a better state of the general health than would otherwise obtain, as the examining physician would,

* Report of this investigation is published as Public Health Bulletin No. 73 by the U. S. Public Health Service. The investigation was made at the joint request of the Board of Health and Anti-tuberculosis League of Cincinnati, extending from March, 1914, to April, 1915.

† J. W. Irwin. Study of the Relation of Prostitution to Tuberculosis. Proceedings of the Sixth International Congress, Volume III, pp. 332–338.

if ordinarily competent, note any evidences of incipient tuberculosis, and would advise the girl of the danger to her life.

The survey was conducted with the coöperation of the Police Department and every woman was compelled to submit to the examination, which could be carefully made, as the conditions for doing so were favorable.

The results of the survey, while not showing a great number of dangerous cases, only 3 being found who were considered a menace to the public, confirmed the suspicion that a considerable degree of tuberculous infection among the dissipating element of a city's population may be acquired from this source, but equally important, when contrasted with the results reported by Irwin, stands forth the value, from a health standpoint, of regulated prostitution, if this evil must exist.

The following tables show in detail the results of the physical examination of the inmates of 68 houses:

	White.	Colored.	Total.
Number examined....	275	40	315
Number of open cases of tuberculosis.....	1	2	3
Number of cases of incipient tuberculosis.	18	1	19
Number of cases of arrested tuberculosis..	5	0	5
Number showing evidences of tuberculosis	24	3	27
Percentage showing evidences of tuberculosis.....			8.57

The 3 cases of open tuberculosis were immediately removed to the hospital by the police and later sent to the tuberculosis hospital. The Health Department will also require the incipient cases to report monthly to the Anti-Tuberculosis League for examination and any action which may be necessary.

These women were all of American birth with the exception of 10, of whom 1 was born in Ireland, 1 in Canada, 3 in Russia, 2 in Austria, 2 in Germany, and 1 in Sweden.

Analysis of the foregoing table shows that of the 27 cases 24 were white and 3 black; all were United States born except 3. Fourteen were single, 11 separated, and 2 married. All but 3 had been employed at some kind of occupation before becoming prostitutes. Domestic service had been the most frequent previous employment, 9 having been house servants in some capacity. The average length of time engaged in prostitution was 6.89 years with extremes of 3 months and 15 years. Of the 27 cases showing physical signs of tuberculous infection there were only 3 cases believed to be a public menace. Five were arrested cases and 19 showed physical signs indicating the disease was either incipient or not actively progressing at the time of examination.

The percentage of tuberculosis (8.57) was much higher among prostitutes than in other occupations. A careful analysis of the individual cases and the general surroundings of these 27 tuberculous prostitutes leaves no doubt of the hazard of the life. All but one had contracted the disease since entering it. However, there are certain factors which serve to show that tuberculosis is not necessarily fatal even when aggravated by such unfavorable

TABLE 3.

TABULATION OF TUBERCULOUS CASES.

No.	Age.	Age when became a prostitute.	No. years a prostitute.	Previous occupation.	Social condition.	Nativity.	Color.	Stage of disease.
1	30	15	15	None	Single	U. S.	White	Incipient
2	25	21	4	Waitress	Single	U. S.	White	Arrested
3	28	24	4	Laundress	Single	U. S.	White	Incipient
4	22	18	4	Office clerk	Single	U. S.	White	Incipient
5	27	22	5	Domestic	Single	U. S.	White	Incipient
6	26	17	9	Cigar factory	Separated	U. S.	White	Incipient
7	26	20	6	Cigar factory	Separated	U. S.	White	Incipient
8	28	17	11	Candy factory	Separated	U. S.	White	Incipient
9	33	22	11	Domestic	Single	Austria	White	Incipient
10	28	21	7	None	Single	Russia	White	Incipient
11	26	21	5	Housewife	Separated	U. S.	White	Incipient
12	23	17	6	Waitress	Married	U. S.	White	Incipient
13	25	24	1	Domestic	Single	U. S.	White	Incipient
14	36	21	15	None	Single	Russia	White	Arrested
15	27	18	9	Shoe factory	Separated	U. S.	White	Incipient
16	26	21	5	Saleslady	Separated	U. S.	White	Incipient
17	21	16	5	Cigar factory	Single	U. S.	White	Arrested
18	24	19	5	Domestic	Single	U. S.	White	Incipient
19	49	35	14	Domestic	Separated	U. S.	White	Arrested
20	24	17	7	Shirt factory	Separated	Sweden	White	Incipient
21	26	22	4	Cigar factory	Married	U. S.	White	Incipient
22	30	20	10	Housework	Single	U. S.	White	Arrested
23	23	20	3	Housewife	Separated	U. S.	White	Active (open)
24	35	29	6	Domestic	Separated	U. S.	White	Incipient
25	22	22	¼	Domestic	Single	U. S.	Black	Incipient
26	27	21	6	Domestic	Separated	U. S.	Black	Active (open)
27	25	22	3	Domestic	Single	U. S.	Black	Active (open)

influences. The following abstracts of histories of the arrested cases are illustrations in point:

No. 2 had been a prostitute 4 years, and although only 25 years of age, her disease appeared to be entirely arrested.

No. 17, 21 years of age, had been a prostitute 5 years, mother having died of tuberculosis. She gave a history of having lost weight and being in a run-down condition after entering the career, but while still continuing she had regained her health, and incidentally taken on 12 pounds. Here was evidently an arrested case, which had reached its favorable state while she was still actively engaged as a prostitute.

No. 22, 30 years of age, had contracted pneumonia subsequent to becoming a prostitute. This had left her with a chronic cough which had disappeared entirely at the time of examination. There were weak breath sounds and dullness over the right lung but no signs of active disease.

No. 19, 49 years of age, mother died of tuber-

culosis. This woman had been a prostitute for 10 years. Eight years previous to her entrance upon this life she had suffered a severe hemorrhage from the lungs. Five years after she became a prostitute she had another hemorrhage. She had had a chronic cough a great deal of this time but has been gaining weight steadily for the last four years.

No. 14, 36 years of age, a prostitute for 15 years, 9 years ago lost weight and ran down in health. Examination shows evidences of arrested pulmonary tuberculosis. She is now robust in appearance and feels entirely well.

In the whole series of 27, there were only 2 giving a family history of tuberculosis. These were both arrested cases, as noted in the foregoing abstract of histories.

There were two factors which, in a measure, tended to counteract the extreme hazard of occupation among the prostitutes who were examined. These were:

1. Age distribution

   (Reference to table "A" will show that 92 per cent. of all those examined were within those age periods when tuberculosis is most likely to be contracted)—and

2. Hygienic surroundings.

   (The most of these cases were recruited from very humble stations in life where their previous hygienic surroundings had probably been worse than those prevailing in their present dwelling places. Good and plentiful food was the universal rule in all the houses in which these prostitutes lived, and the stringent police regulations kept alcoholic dissipation within reasonable bounds.)

Finally, it should be remembered that a careless and indifferent attitude toward all life's problems is a general characteristic of prostitutes. This inherent intellectual inferiority renders them, as a class, incapable of taking proper care of themselves and this factor should be considered when estimating the hazard incident to their life.

Ages.

None of the prostitutes was found below 20 years of age, while 139 or 44 per cent. were under 25, 222 or 70.4 per cent. under 30 and 22 or 7 per cent. were over 40.

For those presenting evidences of tuberculosis 23 or 85.3 per cent. were under 30, as compared with 70.4 per cent. under this age of the total number examined.

A.

Ages of Prostitutes Examined.

20 to 25 years.	25 to 30 years.	30 to 40 years.	40 to 50 years.	Over 50 years.	Not ascertained.	Total.
139	83	69	20	2	2	315
44.1%	26.3%	22%	6.4%	0.6%	0.6%	100%

B.

Ages of Prostitutes Found Tuberculous.

20 to 25 years.	25 to 30 years.	30 to 40 years.	40 to 50 years.	Over 50 years.	Total.
10	13	3	1	0	27
37%	48.3%	11.2%	3.5%	0%	100%

The previous table shows the number of prostitutes for the different age periods, both among the prostitutes as a whole and among the tuberculous alone.

Age at Time Prostitution Began.

As to the age at which these women entered upon the life of prostitution, 238 or 75 per cent. began below the age of 23 and 36 or 11.5 per cent. at or below the age of 16. In 8 instances the life had begun at the early age of 15, in 5 at 14 and in 1 case the prostitution had commenced when only a child of 13.

For the 14 cases beginning this life under the age of 16, nearly all had been in the "tenderloin" many years, the highest 29 and the lowest 5, with an average of 14½ years. Among these women but one case of tuberculosis was discovered, and only 3 were found in anything approaching a poor physical condition, the others being in very good health and of robust appearance. Of the 21 who commenced the life at the age of 16, 1 presented evidences of arrested tuberculosis, while in 5 others the physical condition was marked as only fair. The average length of time at the business for these 21 was 9.7 years, with extremes of 40 and 5.

Among those entering upon the life of a prostitute below the age of 16, the father and mother were both dead in 6 instances, the father alone dead in 6, the mother alone in 1, and 1 girl had no knowledge of her parents. These figures would indicate that the death of one or both parents had much to do with the daughter taking up this life. This is further evidenced by the fact that of those who entered the segregated district at the age of 15, 3 had previously been compelled to go out to work, 1 as a servant, 1 in a tailor shop and 1 in a tobacco factory.

Twenty-two had become prostitutes at or after the age of 30, among these being 2 at 39, 3 at 40 and 1 at 45. Here again the breaking up of the home was apparently the one important cause, as 7 of this class were widows, 6 were divorced and 5 married but separated. From the above figures, therefore, the one conclusion to be drawn is that those who enter upon a life of prostitution either at a very early or advanced age usually do so because death, divorce or separation has broken up the home, throwing the young girl or the woman in advanced years, as the case may be, suddenly and without preparation of any sort, upon her own resources, with the consequence that many tend to follow the line of least resistance and take up what seems to them the easiest way of earning a livelihood.

Number of Years in Life.

As to the length of time these women had been following the career of a prostitute, our figures confirm the commonly stated fact that the average time as a prostitute is from 7 to 8 years. Of the 315 examined, the average length of service was exactly 7 years, although 108, or 34 per cent., had been in the life for a longer period. The length of time for the prostitutes as a whole varied between a few months and 40 years, the great majority being between 2 and 9 years.

Below is given a table showing the length of service for all.

Length of Time in Prostitution.	Number.
Under one year	8
One year	8
Two years	20
Three years	47
Four years	32
Five years	43
Six years	25
Seven years	24
Eight years	21
Nine years	13
Ten years	18
Eleven years	11
Twelve years	11
Thirteen years	2
Fourteen years	3
Fifteen years	6
Sixteen years	2
Seventeen years	3
Eighteen years	4
Nineteen years	2
Twenty years	5
Twenty-one years	1
Twenty-four years	2
Twenty-five years	1
Twenty-nine years	1
Thirty-three years	1
Forty years	1

The girls were also classified as to general physical appearance with the following results:

Robust	147
Good	80
Fair	38
Frail	22
Dissipated	2

These figures do not include those found tuberculous. This shows that 147 or 46.6 per cent. were in very good physical condition. This can be ascribed in great measure to the fact that no alcoholic drinks of any description were permitted to be sold in these houses.

Previous Occupation.

An analysis of the work previously engaged in by the women shows that nearly all were drawn from the working classes, only 27 reporting as not having done any kind of work before becoming prostitutes, and this probably because of the early age at which prostitution was commenced. Eighty-two, or 26 per cent., had been employed in domestic service as house servants, and 72 gave as their only previous occupation that of housewife, this class being from among the ranks of the divorced and widowed.

Among factory workers a greater percentage had been previously employed in cigar factories than in any other line of industry, 17 having come from this industry. Among Irwin's cases, 18 were also from tobacco workers. Whether working in tobacco is to blame for this cannot be positively stated, although the opinion is frequently expressed that the sexual desire in female workers in tobacco is above the normal. "Lack of fecundity and frequent miscarriages are also said to be common among women employed in tobacco factories, as well as retardation in sexual development of young girls."*

Upon questioning one of the prostitutes, who had formerly been employed in a large tobacco factory, as to the reason so many of these workers become prostitutes, she stated that in her own case, and she thought also in many others, it was due to the unrestricted mingling of the sexes permitted in these factories, and not to any

* Reference Handbook Medical Science.

particular influence of the fumes of tobacco.

Eighteen gave their previous occupation as laundresses, but not all worked in laundries.

The second highest number drawn from factory workers was found among shoe workers, 12 having come from shoe factories.

Below is shown in detail the previous occupation of all those examined with number in each.

Previous Occupation.	Number.
Artist's model	1
Cooks	2
Candy factories	4
Can factory	1
Chambermaids	5
Cherry pitter	1
Cotton mill	1
Clothing factory	2
Envelope factory	1
Electrical factory	1
Factory work	3
Forewoman	1
House servants	82
Housewives	71
Laundresses	18
Manicurist	1
Milliner	1
Nurses	2
No occupation	27
Office work	7
Packers	3
Paper box factory	2
Performer	1
Saleswomen	9
Seamstresses	9
Shoeworkers	12
Shirt factories	2
Telephone girls	2
Tobacco workers	17
Waitresses	26

One thing which impressed us most forcibly was the fact that the great majority of these women appeared to be of very low mentality, especially was this true of those drawn from the ranks of house servants.

Parents of Prostitutes.

Of the entire number of prostitutes examined, both parents were dead in 114 instances, the father alone dead in 80 and the mother alone dead in 53, while in but 63 were both parents still living, and in 5 instances the girl had no knowledge of her parents. While these figures would tend to prove that as long as the parents were alive the girl will not be so apt to become a prostitute, still unfortunately, as we were informed by the police, too often the girl enters these places with the full knowledge and consent of her parents and still more strange to relate, is frequently urged to do so by her parents.

As tending to show that the girl or woman takes up this form of life because of the stress of circumstances which may or may not be of her own making, the analysis of the social conditions of the entire number of prostitutes examined shows that 149 were single, 98 divorced, 30 widows and 40 stated that they were married. The latter class was composed chiefly of those who were following this life with the consent of the husband, who shared in the profits, but also included a few who were not on friendly terms with the husband. A large percentage (33.7) of the divorced class had one or more children living, and comparing the age of the youngest child with the length of time as prostitutes indicates that the difficulty of supporting the

child may have influenced the woman in becoming a prostitute. The following table presents interesting data in this relation:

No.	Divorced.			Widowed.			Married.			Single.		
	No. of children.	Age of youngest.	Length of time prostitute.	No. of children.	Age of youngest.	Length of time prostitute.	No. of children.	Age of youngest.	Length of time prostitute.	No. of children.	Age of youngest.	Length of time prostitute.
1	1	7	5	1	6	3	1	9	9	1	1½	½
2	1	5	3	1	10	2	1	13	2	1	11	6
3	1	15	11	4	2	12	1	13	½	1	12	8
4	1	7	4	1	2	1	1	20	5	1	21	16
5	1	6	5	4	4	2	1	25	6	1	9	4
6	2	9	6	1	11	3	2	21	1	2	6	6
7	3	21	12	8	8	10	1	15	7			
8	4	16	1	1	19	4	2	12	18			
9	1	8	3	1	6	5	1	6	4			
10	1	12	11	1	8	9	1	10	8			
11	1	10	5				1	7	5			
12	1	16	9									
13	3	19	12									
14	1	5	5									
15	1	10	8									
16	2	35	25									
17	1	2	¼									
18	1	1½	1									
19	1	39	40									
20	4	16	10									
21	2	13	¼									
22	2	19	11									
23	2	16	4									
24	2	10	2									
25	2	7	11									
26	1	6	6									
27	4	21	14									
28	3	7	5									
29	2	6	3									
30	1	7	5									
31	1	7	6									
32	2	3	2									
33	1	3	2									

Besides these living children, 18 among the divorced, 3 among those who were married, and 6 of the unmarried had given birth respectively to 24, 5 and 7 children who had not lived.

Conclusions.

1. Prostitutes are especially liable to the development of tuberculosis because of lowered resistance and the greater chances of infection.

2. Tuberculous prostitutes are a fertile source of infection among the dissipating element.

3. To the fact that prostitution in Cincinnati is regulated as regards segregation, weekly examinations, and non sale of liquors in the houses is due the comparatively low rate of incidence of tuberculosis found among these women.

4. A large proportion of those who

enter the life at an early age do so because of the loss of one or both parents, and among those beginning the life at a more advanced age the breaking up of the home through death, divorce, or separation is an important cause.

5. A large percentage of prostitutes is drawn from the class of house servants, and mental deficiency is quite noticeable among these women.

6. If prostitution must exist, the examination of the prostitutes at frequent intervals for evidences of tuberculosis, as well as venereal disease, is to be recommended.

AN INSURANCE MAN ON SOCIAL INSURANCE.

At the National Convention of Insurance Commissioners held recently in Richmond, Va., Hon. Rufus M. Potts, superintendent of the Illinois State Insurance Department, and chairman of the Committee on Social Insurance appointed by the convention, discussed social insurance from the standpoint of the insurance expert. Fearing that the designation "social insurance" might produce a hostile attitude on the part of the general public on account of an erroneous association with the Socialist party, Mr. Potts proposes to designate all such plans as "welfare insurance," which he defines as "the use of insurance principles and methods for the purpose of . . . maintaining every citizen of the United States in a state of wellbeing throughout the various misfortunes and emergencies of life that would otherwise destroy his wellbeing and cause destitution and suffering." He called attention to the fact that there is in every country an unnecessary amount of poverty or suffering which is not due to the improvidence or even misconduct of the individual himself, but which is brought about by accident, sickness, premature death of the bread-winner, involuntary unemployment, old age or other causes beyond the control of the individual. He estimates that there are annually in the United States about 82,520 deaths from industrial accidents and 208,000 non-fatal industrial accidents, each sufficiently severe to cause more than seven days' loss of time, and that the total number of non-fatal accidents, industrial and non-industrial, is about 697,000. The number of cases of sickness among working people he estimates at 13,400,000, entailing a total loss of time of 284,750,000 days, or a wage loss of $488,142,852. The number of deaths each year among wage-earners between the ages of 15 and 65 he estimates at 608,239, causing approximately 200,000 dependent families left unprovided for annually. Regarding unemployment, there are practically no reliable statistics. Existing society, accident, sickness and life insurance are wholly inadequate, and reach only a small portion of the total population. Universal welfare insurance under the control of the federal government would, in Mr. Potts' opinion, reduce the expense of operation to a negligible minimum, render it feasible for the nation to contribute to welfare insurance, and compel the improvident to make provision for their families and themselves when overtaken by misfortune. The insurance of all the workers would include such enormous numbers that under the law of average the conduct of the plan would be stable and certain. The increase of production through greater individual and industrial efficiency and the diminished necessity for charitable relief will more than justify the expense involved. Mr. Potts' discussion of the subject is of special interest as coming from an insurance official rather than from a physician, a public health official or a social worker. It is another evidence of the growing interest in social insurance.—*Journal of the American Medical Association.*

A STUDY OF THE PREVALENCE OF B. COLI IN SOME TROPICAL SURFACE WATERS, WITH SPECIAL REFERENCE TO SURFACE WATERS OF PANAMA AND SOME WATERS OF MEXICO.

JAMES TEN BROECK BOWLES, B. S.,
Assistant Director, Bacteriological Dept., Lederle Laboratories, New York City.

Read before the Laboratory Section, American Public Health Association, Rochester, N. Y., September 7, 1915.

IN THE field of bacteriological examination of water, there has been much discussion in regard to the prevalence and significance of B. coli in surface waters.

As a result, standard methods have been made in different countries in regard to the determination of B. coli in water. Since there are a number of "coli types" found, it is very often difficult to draw a line of differentiation between them, and for this reason a water may be condemned when it should not be, or vice versa.

In applying the bacteriological standards of water used in the temperate zone to the water of the tropics, it is often found quite impossible; and if some of these standards were adhered to, many waters could not be passed and would have to be called "unsafe" for drinking purposes. One can readily see how necessary it is to know all conditions surrounding the water under examination before an intelligent report is made.

In making a study of the tropical waters, it is found that lakes, ponds, and tanks, as well as rivers, play a very important part in the water supply of all tropical countries. In dealing with the rivers of the tropics we appear to be dealing with a subject that has no parallel in the North, so great is the difference between the sewage polluted streams of our northern countries and the great floods, such as the Ganges and Indus of the Far East or the Chagres of the South. It is found that out of the rainy season, the rivers move more slowly than our northern rivers. Of course, towns do exist along the banks, but very few have underground drainage systems which might pollute the rivers. Probably for seven or eight months out of the year most rivers flow under an almost cloudless sky. The sun's rays practically vertical, the amount of evaporation from the surface is great and water clear in many cases.

Among the conditions found that disturb our waters, are, the monsoons in the Far East and the torrential rains in the South. During these periods, there are rapid-flowing seas of muddy water. Six months' accumulation of surface pollution is washed into them in a comparatively few hours; but here again, the majority of such pollution is of animal origin, coming chiefly from cattle, goats, etc.

Many parts of the tropics have been

lands of unpurified water supplies or lands where purification does exist but brought about by natural methods.

No doubt one of the best authorities, or probably the best authority, on tropical waters is Dr. W. W. Clemesha, who has made very extensive investigations of the waters of the Far East.

These investigations covered the study of the bacteriological flora of water and feces from man and other animals, before and after monsoons; a systematic study of shallow wells; and a study of the effect of sunlight on fecal organisms.

The routine examinations consisted of: (1) plating a known volume of water on agar; (2) of inoculating with varying amounts, 0.4, 2 and 5 cc., a tube of MacConkey's medium, bile salt glucose broth; (3) plating on agar for 20- to 40-hour-old growth in this medium; (4) addition to peptone water of 5 cc., testing for indol at end of 48 hours.

The results of Dr. Clemesha's investigations showed that many tropical waters do not contain any "typical coli" as ordinarily defined, but are loaded with bacteria. Some of these organisms would ferment glucose, but not lactose.

Water after being stored contained a much higher per cent. of "non-typical coli" (lactose-glucose+) than do the unstored or raw water.

Sunlight has a very powerful action in destroying fecal organisms in water, particularly when not surrounded by mucus derived from the intestines.

B. coli was found only once or twice in water near surface of reservoir, exposed to sunlight, in the Madras Presidency during dry weather, and in four cases out of twelve could fecal bacilli only be found in more than 50 cc., while B. lactis aërogenes was fairly plentiful.

True B. coli communis not present when wide divergence of acid and gas line in two media.

Experiments showed the B. lactis aërogenes rare in feces. After certain stage in natural purification multiplies in water.

Dr. Clemesha concluded that—

(1) Water recently polluted gives the same acid and gas line in glucose and lactose medium.

(2) After few days there is a rapid decrease of all fecal organisms irrespective of class.

(3) While lactose-fermenting organisms go on decreasing in numbers, the glucose+lactose—increase or remain stationary.

(4) Fecal organisms more plentiful in bottom than at surface.

(5) The wider the divergence in acid and gas line in glucose and lactose broth, the older is the pollution.

(6) B. lactis aërogenes found in small numbers when pollution is recent, but increase in numbers when purification has started.

Dr. Clemesha further concludes—

(1) That it is inadvisable to apply the term "coli communis" to a group of organisms or even so-called varieties.

(2) Tests laid down as essential, according to definition quoted, do not go far enough.

(3) It is necessary to separate the individual species of bacilli by well established tests and to study their

characteristics and their position in nature.

(4) That it was advisable to classify all lactose-fermenting organisms according to their ability to resist action of sunlight and on this to base the standard of bacterial purity.

The lactose-fermenting organisms are divided into three classes:

Class 1, the susceptible, containing B. coli and allied members, B. coli representing the undesirable pollution, because it rapidly dies out from water, therefore its presence causes suspicion.

Class 2, the intermediate, water containing resistant organisms alone, commonly met with in tropics, looked upon as safe.

Class 3, the resistant, containing a mixture of two or more classes.

Standards suggested for tropical water:

Good raw water, as a lake, should contain less than 100 colonies per cc. agar 37°; no lactose fermenters in 50 cc.; no lactose fermenters of class 1; glucose fermenters may be present in 1–5 cc.

Fair lake water should contain not over 400 colonies per cc. agar 37°.

Condemned if contains organisms of class 1 in 1 cc.; if fecal organisms are present in characteristic arrangement of fresh feces; if B. lactis aërogenes is scarce; if acid and gas line in glucose and lactose broth is same.

Good river water may contain up to from 100 to 1,000 colonies agar at 37°; lactose fermenters present in 5 cc.; class 1 organisms not present in 20 cc.; glucose organisms present in 1 cc.

River water condemned if it contains countless colonies; if lactose-fermenting fecal organisms present in 10–100 cc.; same with glucose.

After studying the work done by Dr. Clemesha in the Far East in regard to the bacterial content of surface waters in the tropics, I started some investigational work on the waters of Panama, and later on some Mexican waters, using some of the methods carried out in Dr. Clemesha's work.

Canal Zone Water Supplies.

The water supplies of the Canal Zone consist of impounded reservoirs for supplies on Atlantic side of Isthmus and the Chagres River as the supply on the Pacific side of the Isthmus. All of these waters are treated with a coagulant, aluminum sulphate, sedimentated, and filtered through mechanical gravity filters. The supply from Chagres River is also treated with hypochlorite after being filtered.

The watersheds around the reservoirs are policed and no one allowed to trespass on them and no boating or fishing is allowed on the reservoirs.

Thus the only chance for contamination is from wild animals, such as deer, mountain-cow or tapir, wild cats, monkeys, etc.

Water is collected in these reservoirs during the rainy season and held for use during the dry season. We have here real tropical conditions, heavy downpours for about four or five months of the year and then a practically cloudless sky for seven or eight months.

During the dry season the reservoirs act as a sedimentation basin,

and, combined with the action of sunlight, wonderful purification takes place. During this season the bacterial count will drop down as low as 25 and 30 colonies per cc. on agar at 37°. Many examinations may be made during this time of year without getting any test for B. coli. However, I did find that B. lactis aërogenes grew at this time, but was growing only occasionally during the rainy season. I also found types of bacteria resembling B. coli somewhat, but only fermenting glucose and not lactose and having the acid and gas line very wide apart. These results coincide very well with those of Dr. Clemesha in India.

Now during the rainy season, conditions were quite different, as we have the sides of the reservoirs being washed down by the torrential downpours, bringing in much surface contamination. The reservoirs are stirred up, although we only have what is known as a partial turn-over, and the action of sedimentation is stopped for the time being. The sky being clouded, there is no action from the sunlight. The water is not clear as during the dry season, but carries quite a lot of mud and débris washed down from the little ravines.

Examinations of the waters made at this time of year show quite different results. The bacterial count will increase to as high as 1,000 per cc. A few B. coli will be found in 5 cc. and occasionally in 1 cc. In examining for B. coli other organisms of similar type will often be found long after the true B. coli communis has died out. It was always a difficult question to decide how to classify these bacteria, but using the method suggested by Dr. Clemesha, I readily saw that they could not be classed as true B. coli communis and must be called a non-typical type.

Since we had absolute control of the watersheds, and knew that there was no contamination of reservoirs from a human source, the B. coli found during the rainy season was never considered a serious matter. There was no question but that it came from animal source.

The water of Gatun Lake was studied as to its bacterial content.

In the early stages of the rise of Gatun Lake, it covered a great area of dense vegetation and jungle growth. A great deal of this work was done when it rose to an elevation of 56 feet above sea level, and at this time its area was 103 square miles, and steeping in its wide expanse of water was a great deal of thick underbrush, rank grass and many varieties of trees. In the warm shallow waters, this vegetation rapidly decayed and for a time gave to the lake a foul odor that tainted the breezes for at least half a mile to leeward.

The water near the edge of lake, which came in close touch with contamination from the banks, showed a high average bacterial count, viz.: 800–1,000 colonies per cc. and B. coli in 0.5 cc. Near the centre of the lake, away from vegetation and immediate contamination from shore, there was an average bacterial count of 250–300 per cc. and B. coli only in 50 cc. during the rainy season. During the dry season, the bacterial count of

water near shore dropped to an average of 300 per cc. and B. coli only in 50 cc. In centre of lake, the average count was 160 per cc. and only occasionally found B. coli in 50 cc. This might have come from contamination from small launches which occasionally passed over that part.

The Chagres River, which now furnishes the water supply for the Pacific side of the Isthmus, rises very quickly during the rainy season. There are a few scattered villages along the river, but they are small and of course have no sewers emptying into the river. It is quite natural for the native population to wash their clothes and to bathe themselves in the river, but this is at least ten or fifteen miles beyond where the intake is placed for the Panama water supply.

The bacteriological examination of the Chagres River during the rainy season, at a point about a mile up the river from Gamboa, shows an average count of 700 colonies per cc. and B. coli present in 1 cc. samples. During the dry season, B. coli was only found in 50 cc. and the count dropped to an average of 300 per cc. Here again were found non-typical types of B. coli, non-lactose-fermenting but positive glucose-fermenting; B. lactis aërogenes present during the dry season in large numbers.

A Study of Some Mexican Waters.

The city of Vera Cruz, Mexico, has for its source of water supply the Jamapa River, which receives a short period of sedimentation and then filtered through slow sand filters.

This river runs through a very scantily populated district. None of the villages located along its banks have sewers emptying into it. The source of contamination would be through animals or through surface drainage from privies. Another source would be through the natives washing clothes and bathing in the river.

During the heavy rains, the river would carry much mud in it and run an average bacteriological count of 1,200 per cc. and B. coli present in 0.5 cc. Along with the B. coli would be some of the non-typical forms.

During the lower stages of the river in the dry season, the count would drop down to an average of 400 per cc. and B. coli present in only 20 cc. At this time would be found many B. lactis aërogenes and some liquefiers.

In drawing conclusions, I think that the results obtained from my investigation of the surface waters of Isthmus of Panama and one or two streams of Mexico compare very well with many of the results obtained by Dr. Clemesha in his work in the Far East. However, I realize that Dr. Clemesha's work was much more elaborate and was carried on over a longer period of time.

One can see that it would not be just to condemn the waters on account of presence of B. coli, and since watersheds of our reservoirs are entirely under our control and well policed, we have a right to feel that the pollution is not from human source.

Thus it does make those who have worked with tropical waters, question, sometimes, the amount of stress that

can be placed on the presence of B. coli alone in these waters.

It is further illustrated that the standards used in cold climates must be adjusted to conditions in tropical countries.

(This investigation was carried on when the author was Physiologist of Canal Zone Water Supplies and later Sanitary Expert with the U. S. Expeditionary Forces at Vera Cruz, Mexico.)

The following methods of examination of water were used, as outlined by Dr. W. W. Clemesha:

1. Total colonies in one cc. on agar made according to Standard Methods. Plated at and incubated at 37° C. for 48 hours. All colonies visible to naked eye counted.

2. Bile salt broth. Varying quantities of the water are put into fermentation tubes incubated at 37° C. for 18 to 24 hours.

For making sub-cultures, take tube containing 20 cc. water incubated for 18 hours. One loopful of bile salt broth taken out from tube and put into 10 cc. of sterile water. A loopful of this dilution is carried to another 10 cc. of sterile water, and so on to a third. A loopful from tubes 2 and 3 is put on center of plate containing solid medium and spread out with sterile glass rod.

The solid medium is a bile salt neutral red lactose agar. The presence of bile salt and neutral red tend to retard the growth of moulds and air organisms. It is melted into plates 24 hours before use. The plates are incubated at a temperature of 37° C. for 24 to 48 hours. Some colonies appear bright red, others have a red center with pale rims, others were white or yellow.

Having obtained a good plate with 10 to 12 distinct colonies on it, each separate colony is now put through the various sugar reactions, such as 1 Saccharose, 2 Dulcite, 3 Adonite, 4 Inulin.

LIST OF MEDIA USED IN THE WORK DESCRIBED.

I (Stock solution A).—Bile salt glucose peptone neutral red broth.

Peptone	60 grms.
Sodium taurocholate	15 grms.
Glucose	15 grms.
Water	1 litre.
Neutral red	10 cc. of 5 per cent. solution.
Normal sodium Carbonate solution	Till neutralized as indicated by the neutral red.

(B Solution.)

2 parts of A solution + 1 part of water.

(C Solution.)

1 part of A solution + 1 part of water.

(D Solution.)

1 part of A solution + 2 parts of water.

II. Bile salt lactose peptone neutral red broth. Same as above, lactose being substituted for glucose.

III. Bile salt lactose peptone agar.

Peptone	20 grms.
Sodium taurocholate	5 grms.
Lactose	10 grms.
Agar	20 grms.
Water	1 litre.
Neutral red	10 cc. of 5 per cent. solution.
Normal sodium Carbonate solution	Till neutral point is reached as indicated by the neutral red.

IV. Bile salt peptone neutral red sugar medium.

Peptone	10 grms.
Bile Salt	5 grms.
Sugar	5 grms.
Water	1 litre.
Neutral red	5 cc. of 5 per cent. solution.

To prepare diffierent sugars, the particular sugar is substituted in the column of sugar in the above solution.

The following sugar media are made:

1. Saccharose.
2. Dulcite.
3. Adonite
4. Inulin.

THE RELATION OF HOUSING TO THE PUBLIC HEALTH MOVEMENT.

By Lawrence Veiller,
Secretary, National Housing Association, New York City.

IT WOULD indeed be a rash man in these days of progress who should attempt to set limits to the public health movement.

When health commissions regulate so many aspects of human welfare from the speed and number of subway trains to the ingredients of proprietary medicines it would surely be unwise to say that any phase of municipal activity is not a proper function of a department of health.

When one considers how many health departments have in past years been buried under the mountain of garbage removal it is not strange that there should be a rather insistent demand for a chance to do what is strictly "health work."

But by what touchstone can the ordinary health officer decide what is properly "health work" and what is not?

Up to the present, there has been no enunciation of principles by such organizations as this to guide him in his determination. He has been forced in most cases to drift with the current, to develop those activities which the public has become accustomed to expect. And, let me whisper it, there have been known instances where he has gotten into a rut, and even, sometimes, where he has been content to stay there!

The basis of the complaint against much of the public health-work of the country is that it is purposeless. It lacks cohesiveness. It does not tend anywhere. Few health officers have developed a program of health work for their community. It is a great thing to take time every once in so often to see where the ship is heading and to set your course anew, if need be; to correct old conceptions, to discard old theories, to get new vision, to sail among the new currents. There is a great exhilaration in steering for a new land, sometimes on an uncharted sea.

If there is as yet no generally accepted standard of what is properly "health work," how is the average health officer to guide his course, determine the limits of his field?

The decision as to what properly is health work is to be reached very much in the same way, as the community itself must reach decisions as to what is properly "municipal work." There is no hard and fast line; no acid test; no municipal litmus paper, by which each community can be guided. What was "Socialism" yesterday, every one today accepts as a matter of course. There are only *principles* to fall back upon!

The health officer must decide his question on the same principle that the

community itself does other municipal ones. It is a very simple one viz: Will it be more beneficial in the long run for the community to do a given piece of work itself or will better results ensue if this particular activity be left to private enterprise.

The health officer has to ask himself two questions with regard to any proposed activity.

(1) Will it promote health?

(2) Can some other branch of the government undertake it more appropriately?

You will note that the question as I ask it is not, "Will it promote *public* health?" but "Will it promote *health?*" The time is rapidly approaching, if it is not already here, when the health official has got to concern himself with private health, the health of the individual as well as with public health, the health of the community; for the community is nothing more nor less than a collection of individuals. The cell theory applied to civics. This has already been demonstrated by ten years of anti-tuberculosis work, where the education of the individual in the measures necessary to protect his health has been the keystone of the movement. So, too, we see this principle accepted in the more widely recognized acceptance of the work of health education which has been so fully discussed in this very conference, and lastly in the principle of life extension, which we are also discussing here and whose very essence resides in personal hygiene.

In the light of these considerations, it is appropriate to ask, "What relation has housing reform to the public health movement?" The answer to the first of our standard questions, "Does it promote health," will produce no dissenting opinion. As to the *value* of housing reform there is no opportunity for discussion, at least among sanitarians, though I know many speculative builders and slum landlords, however, who are still sceptical about it!

Where difference of opinion will arise will be in answer to the second of our questions "Can it be undertaken more appropriately by some other branch of the government than the health department?"

The organization of our municipal government in most communities in the United States follows along such generally uniform lines that we can without serious difficulty generalize on this subject. In most cities we find a health department, a fire department, a police department, a department of public works, a department of education, a department of parks, of streets, of charities, of correction, of finance. In different cities they sometimes have different names, just as "the ocean receives different names on the various shores it washes." Often, too, they are combined in different ways, in some cities several cognate departments are grouped together in one department of public safety or public works as the case may be. And sometimes they are combined in most *remarkable* ways apparently without the slightest relation to the appropriateness of their functions. In the larger cities, as municipal government becomes more complex, we find increased specialization and the roster of the various

branches of the city government increases. Thus there is added a department of buildings, of docks, of bridges, of water supply, of recreation, etc.

Efficiency in municipal government, as in business affairs, comes with specialization of function. So we may expect to see new departments emerge as the years go by.

As we contemplate this group of branches of municipal government, my hearers will, I am sure, agree with me in saying that their mere enumeration is sufficient in itself to answer the question just asked as to whether any of them can more appropriately undertake the work of housing reform. You would dismiss immediately as a preposterous idea, the suggestion that such work should be undertaken by the department of finance of any city or by its department of education or by its department of streets, or by the police or by the fire department, or by the department of charities, correction or parks. There is an appropriateness here as in other affairs of man.

So, by a process of elimination, we find that housing reform belongs to the health department.

If not performed by that branch of the government, it is safe to assume that it will not be looked after by any. There are of course exceptions to every rule. In some cities there may be exceptional conditions which make it advantageous to separate this work from the city's ordinary health work. But the point I wish to emphasize is that the alternative is not in having this important work an incident to the work of some unrelated branch of the city government where it will be neglected, but in vesting these functions in a separate department charged with sole responsibility in this field, where it will be given special attention.

New York is a case in point. There fifteen years ago we found a health department buried under the burden of regulating the sanitary condition of 80,000 separate tenement houses, the home of a million and a half of people. As a result, few of its functions were adequately performed. Housing conditions suffered, as did the other health work of the city So we freed the health department from its burden, by relieving it of this responsibility and established a new branch of the city government—the tenement house department, whose sole function was responsibility for the housing conditions of the people. How necessary the establishment of that department was is evidenced by the fact that today it comprises nearly 800 employees and the financial authorities of the city last year appropriated for its work about $800,000.

When you come to think of it, it is worth while to look after the home conditions of over three million people.

The results of this readjustment of municipal functions has been quite remarkable. The improvement in housing conditions has been little short of revolutionary. From having the worst housing conditions in the world, New York has come to have in some respects the very best.

The effect on the health work of the city was equally remarkable. Freed from the burden under which it had been struggling for years, the

health department emerged and undertook some of the work which theretofore it had been forced to neglect. From that time, dates its effective work in child hygiene, regulation of the milk supply, medical inspection in the schools, and literally a hundred phases of the work which has made the New York City Health Department the most efficient in the world. It couldn't move before. It was tied hand and foot.

But New York is an exception to the general rule. I should not urge the establishment of a separate branch of the government to look after housing conditions in many other cities—in fact, in no city of the United States except perhaps in Chicago. The reasons which made this course wise to follow in New York, viz., the existence of 80,000 separate buildings housing 1,500,000 people, are not to be found elsewhere. When they are, the same course can be followed, presumably with equal profit.

Although I have said there is no difference of opinion among sanitarians as to the value of housing reform, it may not be inappropriate to consider for a moment how vital a thing it is. The slightest reflection reminds us at once how closely related it is to practically every other phase of health work. What can be more fundamental than the living conditions of the people?

Of what use is it for a city to build tuberculosis hospitals and sanatoria, maintain day camps and dispensaries, employ a corps of visiting nurses and physicians, if all the time tenements with dark unventilated rooms are breeding the disease faster than the medical profession can cope with it?

How futile it is to send a man away to a sanatorium for six months, feed him, watch over him, nurse him, care for his family at great expense while he is away, then discharge him as "cured," to sleep and live in a three-room tenement of which two of the rooms are little better than dark closets without sunlight—dark unventilated breeders of disease.

How profitable is it for a city to spend vast sums of money to ensure a supply of pure water to its inhabitants and at the same time to allow barbarous privy vaults, sinks of iniquity, to drain their contents into private wells, still used by "conservative" citizens who cling to them with startling tenacity.

Is it more profitable to teach our citizens to "swat the fly" or to do away with their breeding places.

We carefully watch over the health of our school children while in school, but most cities pay little or no attention to the conditions under which they live. We build open air classrooms for them when they have become anemic or tuberculous, but do little or nothing to do away with the dark, damp, air-shaft and basement rooms that have helped to make them so.

I might go on almost indefinitely with these illustrations, but enough has been said, I am sure, to show the vital necessity for every community to look after its housing conditions.

No civilized community can afford to neglect these things. Yet, many that would deeply resent being thought

not civilized tolerate most barbarous conditions. I am happy to say a new era is dawning in this respect. We are at last awakening to this state of things and the necessity for action.

The fight against unsanitary conditions, however, can no more be waged successfully without weapons than can modern warfare be carried on without guns, bombs, shrapnel, barbed wire entanglements, aeroplanes, tools for digging trenches or ammunition. If we are to fight, we must have the tools and engines to fight with. To the sanitarian, the tools are trained men, adequate appropriations, freedom from political interference, security in office.

While I would not urge upon any city the establishment of a separate branch of the city government to look after housing conditions, I *would* urge the creation of a housing bureau in every health department in every city. Until this is done we may expect little progress to be made in housing reform. The work to be done is of sufficient moment to deserve the undivided attention of men especially trained and equipped by experience for it. Without such a bureau neither will adequate funds be provided nor will there be that continuity of service that the subject requires.

There is one element in this subject that has not been touched upon which we cannot afford to lose sight of—one which every experienced health officer will recognize with a sympathetic heart throb, and which every courageous and forward looking one will go forth valiantly to meet. And that is, that his housing work will produce more friction, encounter more opposition and create more enemies for him than any other phase of his work. I am almost tempted to say than all other phases combined. For, here, he will antagonize not merely one interest; he will touch the pocket nerve of nearly every citizen.

He will in addition have to lift a mountain of inertia, to contend against a satisfaction with things as they are and frequently will have to overcome the opposition of the very men to whom he could most naturally look for support.

But let him not be downhearted, or falter in his course because of this. The work that has no difficulties attached to it, isn't worth the attention of a red-blooded man.

Let him not be discouraged. In the end he will overcome his difficulties. In the recent words of that great statesman Elihu Root:

"There never was a reform in administration in this world which did not have to make its way against the strong feeling of good, honest men, concerned in existing methods of administration, and who saw nothing wrong. It is no impeachment of a man's honesty, his integrity, that he thinks the methods that he is familiar with and in which he is engaged, are all right. But you cannot make any improvement in this world without overriding the satisfaction that men have in things as they are, and of which they are a contented and successful part."

THE RURAL SEWAGE PROBLEM.

ENNION G. WILLIAMS, M. D.,
Health Commissioner of Virginia.

Read before the Public Health Administration and Sanitary Engineering Sections, American Public Health Association, Rochester, N. Y., September 7, 1915.

Dr. Williams emphasizes the importance of discussing rural sewage or a rural problem and remembering that it is not to be dealt with successfully unless it is distinguished from the city problem.

THE rural sewage problem is not only one of privies and law-enforcement but also one of sentiment and education.

Those of us who are connected with state health departments are perhaps most conscious of this truth when we have to deal with the contrast between the people of the cities and those of the rural districts. In the cities we can presuppose a certain amount of popular education on the prevention of disease; in the country we have to begin that education. In the cities men are fully aware of the danger from the diseases of their neighbors; in the country, a man's neighbors may be so far off that he regards their maladies with indifference. In the cities, men readily see the mote in their neighbor's eye and can have the beam in their own pointed out; in the country, the farmer usually does not suffer from his neighbor's shortcomings and does not like to be reminded of his own. In the cities, the householder comes in daily contact with laws and their enforcement and is disciplined to their operation; in the country, the farmer views the law as something to be invoked only in an emergency. In the city, the direct expenditure of money for comfort and convenience is so habitual that a small outlay for sanitary improvements is seldom considered except by the poor; in the country, the investment of even a few dollars in cash in a privy is regarded by most citizens as a serious matter and the appropriation of public funds for health work is usually regarded as a waste. And so the comparison might be extended to cover a host of differences in our sanitary problems between the congregate life of the city and the distinctly individualistic life of the country.

For our purposes, however, these differences may be summed up in the well-known fact that, despite familiar advantages, many rural sections now suffer more severely than do the cities from the diseases of filth and must, in consequence, be given attention by sanitarians. Ephraim cannot be left to his idols: those idols of insanitation must be destroyed and his health protected.

How to do this is our problem. If we know and can demonstrate beyond all question that failure to have sanitary privies and to use them is responsible for the spread of filth that carries the germs of disease, how can

we make that knowledge a matter of direct moment to the farmer, whose traditions are all to the contrary.

My answer, I suspect, will be a familiar story to those whose work has been along similar lines to my own. We must approach our problem by a process of elimination. In full appreciation of the difference between the city man and the farmer, we must not try at the outset to apply city methods in rural districts. In particular, I think, we must avoid, at the outset, a policy of rigid law-making and law-enforcement. If we pass an ordinance in the cities, providing that every house must have sewer connection, we are usually able to enforce it; if we adopt such a law or regulation for the country, we not only tax to the utmost our resources of inspection but we arouse the antagonism of those who resent being told how they must and must not dispose of their filth. For our part, we have, in Virginia, had recourse to the regulations prescribing sanitary privies only in those communities where popular education has already been had or in extreme cases where there was immediate danger of disease. I must say that I do not feel our work has thus far suffered by our failure to "educate" through warrants and fines.

If, then, we eliminate that weapon which the health officer most frequently uses in the city, what shall we substitute for it. I can give the now familiar answer, education, and seek to define its methods as they apply to the rural sewage problem. The farmer may be resentful of outside suggestion; he may be so stubborn that it takes an epidemic in his vicinity to convince him. More frequently, however, he is merely ignorant and needs only to be approached in the right manner to be enlisted in behalf of better sewage disposal. We must apply the Baconian maxim tactfully that the wise may learn by reason, men of less understanding by experience and, if need be, the "most brutish" by necessity.

This education must be gradual, it must be diversified and it must, in every instance, be based on common sense. We cannot expect a community to be educated in public health because one of our officers has lectured there a few times and has distributed health literature; we cannot afford to rely too much on a single method of public education; we must not set a sanitary standard in the backwoods to which only the cities can attain.

To consider the last-named essential first, I think it is highly important that we recommend privies of designs proportionate to the means of the householders. Some rich agriculturists can afford to spend several hundred dollars on water-closets and a septic tank; some have the means to install the more elaborate styles of dry closets; some can only afford the simplest devices. If we are to get anything done, it must be by adopting designs simple and inexpensive but safe and practical, while keeping in reserve, for those who may want them, the more elaborate systems. Thus, I am told of a poor but earnest negro who practised a sound gospel of sewage disposal by digging a hole in the ground behind a bush, using this when necessary and keeping it covered with boards when not in use. Manifestly

this was not as desirable or as comfortable as half a dozen devices we recommend. But I need not say it was infinitely better than an untended, open-back privy, where the filth is accessible to flies. On the general principle that men will listen with keener ears when little is asked than when much is demanded, I believe in recommending the simplest, safe privy for general use. It is far better to come below the expectation of the fastidious than to go beyond the means and interest of the humble.

As for diversity in the process of education, I doubt if I can do better than briefly to describe what we have done in Virginia. Our aim is, of course, first to point out the actual and potential danger of the careless disposal of filth and then to show how these dangers can be averted. To these ends we have used bulletins, public lectures, newspaper stories, posters and, in recent months, metal placards which we have tacked to the fences and the store-porches, preëmpting the space formerly used by the patent-medicine advertisers. Largely through these methods, and others upon which I have not time to dwell, we have cut our typhoid morbidity in rural Virginia by almost precisely 50 per cent. in recent years.

But we must, I think, freely admit the limitations to educational methods, it matters not how diversified they may be. Something else is needed if even a gradual betterment in rural sewage disposal is to be had. We must proceed with due regard for the slowness with which a good idea spreads and an inherited way of doing things is laid aside. My own belief is that we must do as much general educational work as possible and then apply intensive methods. Thus, in my own state, after an active educational propaganda of four years—coupled, of course, with the investigation of outbreaks—we began holding hookworm dispensaries in accordance with the plan of the Rockefeller Sanitary Commission. These dispensaries did much good and gave us an opening for future work, but they did not result in as much direct privy-construction as we had hoped. We have in recent months, therefore, been conducting intensive community campaigns, in coöperation with the International Health Commission. In these we make house to house visitation and have each health officer accompanied by a carpenter with instructions to help any farmer who wants to build a new privy or to render an old one sanitary. In other communities we are trying the experiment of citizens' associations, supporting a visiting nurse. Throughout the state, too, we are doing such extension work as we can through the schools, knowing that our best results are to be had through the rising generations. In the same process, which I have not time to trace in detail, we have the higher goals, of course—the appointment of rural health officers and inspectors and, in the end, the enforcement of law with the same public support we have in the cities. It is a long, long battle. But for my part I believe that we have only to consolidate our victories, so to speak, and proceed with a full recognition of the peculiar nature of our problems to attain the desired end of good health for all the people everywhere.

A PROPOSED BUREAU OF INDUSTRIAL SAFETY, SANITATION AND HYGIENE, TO BE MAINTAINED ON THE MUTUAL PLAN.

C. D. SELBY, M. D.,

Secretary-Treasurer, Ohio State Medical Association; Managing Editor, Ohio Medical Journal. Commissioner of Public Health, Toledo.

Read before the Industrial Hygiene Section, American Public Health Association, Rochester, N. Y., September 7, 1915.

CERTAIN of the industrial diseases and accidents are preventable. This has been proven.

It is no longer necessary to plead that the conservation of life and the preservation of health are humanitarian. It is no longer necessary to demonstrate that a human life is a thing of value. It is no longer necessary to convince the employer that his use of the body and mind of his employee may prove profitable or expensive.

The employer now recognizes his employee as a machine of considerable value, the destruction or injury of which is a source of expense and to be avoided. The workman has come to realize that his brain and his hands are the capital with which he does business, and with this realization has come the knowledge that he must conserve them.

Today the one common bond between capital and labor is the hand of toil, and both are seeking to keep it intact. Employer and employed are working together in a broad safety and welfare movement.

The employer, it would seem, is the one to inaugurate such a movement. His position of control gives him the authority to organize the necessary departments. But the employee must be given sufficient responsibility to expel the feeling that he is being exploited. Certain welfare movements have failed because the beneficiaries were not duly considered. Some manufacturers have been keen enough to leave these affairs partly in the hands of committees chosen from the workers, a method of administration that has proven effective.

If left to the initiative of the employer, however, conditions of safety, sanitation and welfare will vary from no attempt to highly developed departments. There appears, then, a need to standardize the work. Standardization cannot be accomplished without central control, and the controling body must be representative of both of the interested parties.

In the Joint Board of Control one finds an exceedingly effective central body. The work of Doctor Price has attracted world-wide attention; he has demonstrated the utility of the method. But Doctor Price is an exceptional man, and the garment makers are exceptional people. Although the work of the Joint Board has proven of much educational value, its methods have not been imitated widely, and the plan is not adapted to all trades.

One must look beyond the Joint Board. One must look to a central

body that is representative of and responsible to all classes. One finds that in the government. Government control is the ultimate solution of the industrial safety and welfare movement.

In Ohio the state departments of labor and health have sensed their responsibility. The health department, through Dr. E. R. Hayhurst, has made a survey of the industrial diseases. The report of this survey is probably the most comprehensive work on the industrial diseases yet published. It has aroused much interest and stimulated activity in the prevention of the neglected occupational diseases. Although the work of the division of industrial diseases has been extended, its scope has been restricted by lack of legal authority, a handicap that undoubtedly will be removed by an early legislature. When Ohio passes the necessary laws, she will find her board of health prepared to exercise control of the industrial diseases.

The industrial commission (department of labor) of Ohio, through its safety director, Victor T. Noonan, has already launched an effective safety campaign. But, as is true of the board of health, the industrial commission has not the authority to act in the capacity of a board of control. Its work at present is largely educational.

Ohio is working along the right lines and will eventually exercise control of industrial safety and hygiene. To be efficient, however, the state departments must have local representation. Every municipal board of health should have a division of industrial diseases, and there should be a division of city government to work in coöperation with the state department of labor in preventing industrial accidents.

Although state control is an end greatly to be desired, it is obvious that neither the state nor the municipality can carry out the details of prevention. These must always rest with the employer and the man himself. The government can and should show the way; the employer must provide the means; and the men must coöperate.

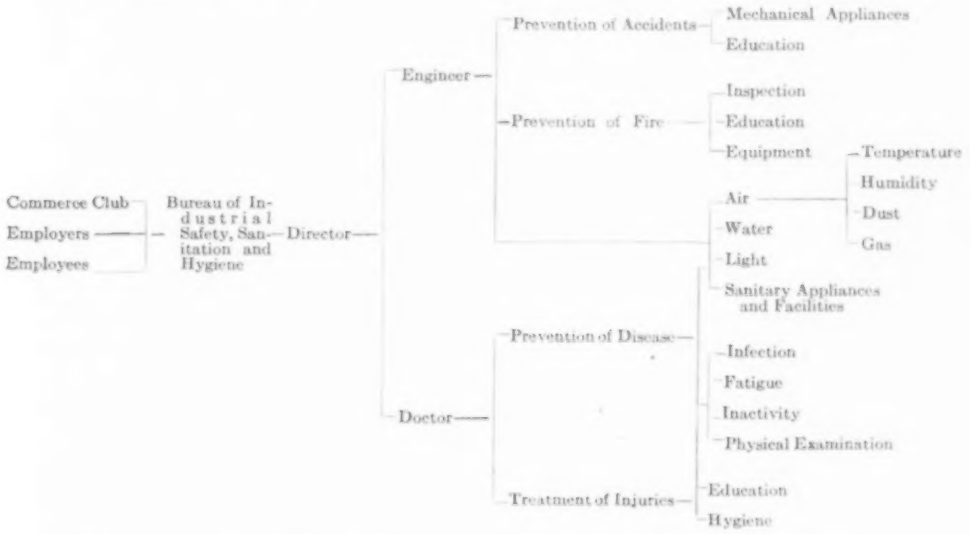
It is possible for an employer of a thousand or more men to equip his place with an adequate and comparatively inexpensive department of safety and sanitation. He is able to employ a doctor, a safety engineer and a welfare man. In fact, it is profitable for him to do so. A number of the big plants of Ohio have taken up the work of prevention on an elaborate scale.

But the small employer, the one with a dozen or a hundred or so men, cannot install such a department with the full-time service of a physician and other experts. The cost is the obvious obstacle. If he is to have the aid of these specialists, he must share their time with others.

The problem of the small employer suggested the organization in Toledo of a Bureau of Industrial Safety, Sanitation and Hygiene. This bureau is designed to do for the small employer what the large manufacturer is able to do for himself. Its activity displays itself in educational work, the exchange of information, the making of investigations or surveys and the offering of recommendations—in short anything that increases the efficiency of

the employee and lessens the hazard to his health, limb or life.

A manufacturer has a problem. The bureau investigates and offers a solution. A small employer has no safety department. The bureau shows him how to use his limited means and help in organizing one. But details are unnecessary. The utility of such a bureau is evident. Its plan of organization and lines of work are indicated by the following outline:



This bureau is yet a paper organization, with excellent prospects, nevertheless, of soon becoming a living reality. The estimated annual expense is $12,000. The Commerce Club will probably bear a share of this. The balance will be prorated among the employers subscribing to the bureau according to the number of their employees.

This is a reasonable service for a commerce club. The bureau stands for industrial efficiency. Industrial efficiency makes for commercial prosperity, which is the ultimate attainment of the commerce club.

Such a bureau fits nicely into the general scheme of the movement toward industrial safety. It is not designed in any wise to take up the functions of the various departments of state and local governments organized to prevent industrial diseases and accidents. It does not eliminate the need of a National Council of Industrial Safety or any society interested in the well-being of the employed classes. It merely represents collectively the small employers in matters of prevention. It aids the government and all organizations interested in the conservation of human life and limb to reach the small employer. It enables the small employer to do for his men what he otherwise could not do. In fact, this bureau is the small employer in matters of industrial safety, sanitation and hygiene.

THE USE OF LIFE TABLES IN PUBLIC HEALTH WORK.

MILES M. DAWSON, F. I. A., F. A. S.,
Consulting Actuary, New York, N. Y.

Read before the Vital Statistics Section, American Public Health Association, Rochester, N. Y., September 10, 1915

In this paper a man not professionally engaged in public health work but familiar with the difficulties of rendering vital statistics useful in that work and technically trained to cope with such difficulties, discusses some of the important features of "The Book-keeping of Pub.ic Health."

IT IS so plain as to be axiomatic that if we wish to improve the health and the longevity of a people, we must, in order to do effective work, first know the facts. Mere impressions will not do, and the one fatal mistake about the inductive method of reasoning is that it is altogether too often applied to wholly insufficient data, resulting in erroneous conclusions.

It is this, quite as much as the want of discernment on the part of those who have handled statistical data, resulting in their failing to apprehend the true significance of the ratios deduced, which has caused the prevailing notion that statistics are misleading. The fact is, on the contrary, that the very basis of all scientific knowledge is the observation of an adequate number of phenomena, the adoption of generalizations based upon such observation and deduction from these generalizations.

That this is true as regards the use of life tables is indicated also by the experience of the country which first collected vital statistics and framed population life tables from the data thus obtained. That country, Sweden, had already so far advanced in those days in the matter of recognizing the importance of vital statistics that it was even then securing the very information which is essential to the formation on correct principles of life tables, viz.: The births ascertained by means of compulsory registration, the deaths at the various ages ascertained in a similar manner and the population at the various ages ascertained by enumerations at frequent intervals. From the data thus secured population life tables were already being made one hundred and fifty years ago, when Dr. Richard Price was, by painful experiments and proceeding with faulty methods, deducing from the death records alone of a single parish in Northhampton the fallacious and misleading table which, bearing the name of that city, became famous and is still treated with respect by American courts.

The significant thing is that this very country, Sweden, exhibits now and has exhibited for a long time the lowest mortality at practically all ages and the greatest longevity, of all the countries of the world. While this may be, and doubtless is, in part

attributable to the salubrious climate and healthful conditions of the country and to the inherent vitality of the race, it is equally beyond doubt that in large measure it is the direct consequence of the more accurate and reliable information concerning these matters, which the authorities and publicists of Sweden have produced, in the form of the repeated investigations by means of which it has been possible, both to know what the actual mortality experience of the country is and whether it was retrograding or improving in this regard.

It is also obvious that precisely this is fairly to be expected. Wise men, knowing precisely what is happening and what causes are at work, may conceivably modify the results favorably by eliminating or frustrating the unfavorable forces and thus giving the favorable forces full play. It is not to be expected that such modification will be realized if the facts are not known, even though the causes are suspected, since in such case the extent of the operation of these causes is also not known.

These things are commonplaces. The only real issue is, What information should be elicited in order that the use of life tables may be more effective? There are not wanting those who consider that mere general death-rates modified, if that seems to be requisite or desirable, so as to bring them so far as possible upon the same basis, will answer all purposes. There are others also who consider that if the average age is ascertained—which is also, of course, the average expectation of life, roughly, computed from birth—this should be sufficient and yet others who are confident that if expectations of life are computed by some fairly approximate process for various groups of ages, this will or at least should be satisfactory. There are yet others who urge that general mortality tables or life tables deduced from data of the entire population are precisely what is wanted and that if by any possibility further information is desired it will be sufficient, if a significant comparison can be instituted between this general experience and the special experience within a given group.

In order to consider these various things and their suitability for the purpose, it is necessary first to know that the two things requisite for forming sound conclusions from the observation of the data of vital statistics is that there be no serious defect or error in the data which cannot be allowed for and that the statistics deduced from the data be upon such a basis that comparison will inform the student and not confuse him.

The form in which vital statistics will obviously be most significant and useful is as follows: First, life tables showing the actual mortality rates at the different ages for persons not exposed to special occupational or other hazards, proper distinctions being made also according to (a) race, (b) sex, and (c) age. Second, life tables—or comparison of actual and expected deaths, the latter computed according to the normal or non-hazardous life table corresponding with the experience thus under observation—showing the mortality

rates at the different ages of sections of the population engaged in the various occupations (treated separately) which are by actual test found to be hazardous to life, these sections also being distinguished if possible according to (a) race, (b) sex, and (c) age. Third, life tables showing for occupations found not to be hazardous, the mortality in different sections of the country as in different states separately or in different regions, including a number of states or in cities of a certain size or even a given city.

Certainly this would be the ideal, and one which it would not be impracticable to work to, approximately and with best results. All that would be necessary would be to analyze the data in sections, first; then assembling, as upon preliminary investigation proves to be wise and proper, the bodies of data so as to produce the larger tables.

One of the most serious defects in connection with the vital statistics work which has been done in other countries—and a defect which it ought to be possible for us to avoid in consequence of our undertaking the work later than the other countries, and after having had an opportunity to discover the errors into which they have fallen—is that they have instituted comparison with a so-called general population table, by which is meant a life table deduced from the experience of the entire population of the country, including the lives which are exposed to special hazards, occupational and otherwise. The nature of the error here involved is readily recognized when it is considered that such a table is affected by the very aberrations from the norm which it is intended to measure and also that from one period of investigation to another this general population life table is thus affected in varying degrees.

This means that such a table is never suitable for comparison of this character and must give misleading results, always underestimating materially the effect of evil conditions; and, in addition, that the use of such tables, deduced from successive investigations, is yet more misleading because they are not equally affected, the proportion of those engaged in hazardous occupations being less at one time and more at another and, therefore, unequally affecting the mortality exhibited by the different general population life tables.

The necessity for a proper starting point or base line from which to make the measurement of the departures has not only not been understood by those engaged in framing population life tables, but also until recently was not understood by the actuaries of insurance companies. So late as the investigation of classified mortality by the Actuarial Society of America in 1903, a population life table, distinguished from a general population life table only in that it was constructed from data collected in so-called healthy districts, was employed as a basis for measuring the extra mortality due to special hazards of occupation and of impaired lives; and it was only in the medico-acturial investigation just completed that, upon

a suggestion brought forward by myself at a meeting of the Actuarial Society of America, the experience of the companies upon lives accepted as strictly first-class and free from special occupational hazards was collected to form a table which has come to be known as the Medico-Actuarial Select Mortality Table, by means of which the departures of the mortality experience in the various groups of lives, believed to be exposed to special hazards either on account of occupation or on account of some defects in the lives themselves, could be measured with a great degree of accuracy. In consequence of the adoption of this method, it is now found that, notwithstanding the fact that mortality conditions have generally improved, the percentage of excess mortality thus properly measured is very materially greater in practically all cases than the percentages shown by the previous investigation which were arrived at by using a general population table as the standard.

It is clear that if one can put down, side by side, the mortality that would be experienced under favorable conditions among a group of persons at a given age or a small number of consecutive ages and the number of deaths actually experienced under the conditions really prevailing, the facts concerning the influence of these evil conditions are complete and unmistakably manifest. By no other means can so significant and reliable results be secured.

Thus, for instance, as regards the general death-rate as a means of comparing the deaths between one community and another, it is practically certain in the first place that the distribution of the population by ages will differ in one community from another. The exposures by races and even by sexes will, likewise, be different and the distribution of the various occupations in the community is likely to exhibit even greater divergences. In consequence of these things it is not possible to modify general death-rates so that comparison can be made even approximately upon the same basis nor indeed, were this successfully accomplished, would it necessarily be of any particular value or significance, because it would afford us no information concerning mortality at the different ages or even periods of life nor concerning mortality among the different races or as between the sexes nor concerning mortality as affected by occupation, housing, sanitation or any other of the distinctions which have come rightly to be recognized as most powerful in affecting the death-rate.

In the same way the average age in the community taken as the average period of longevity measured from birth would have, even if it were accurately calculated, very limited significance and value. It would give no information concerning the causes which were at work to produce a lower average age in one country than another, among which varying causes might be a large stream of immigration, causing a greater preponderance of persons at the younger ages, a very large birth-rate with the accompaniment of a large, infantile death-rate, or the destruction of human lives in

their early maturity by the scourges of plagues due to poor sanitation or similar destruction, due to the prevalence of diseases arising from evil occupation conditions. Thus you would have a range all the way from the simple condition of a population heavily recruited by immigration of young people resulting in a low average age, which would have no significance whatever regarding longevity, to the most evil conditions, but of the most variant character, entirely escaping accurate observation and defying classification, if no more information could be commanded than merely average expectation of life.

In a similar manner, that greatly over-valued factor, the expectation of life for each age or for groups of persons within the same five years of age, is found to be fatally defective as a means of supplying illuminating information concerning what is actually taking place regarding the longevity of men upon the earth. In the first place, the expectation of life affords no certain indication of how the deaths are taking place. Theoretically, it could be realized by all who start out from a given age, surviving that precise number of years longer; and equally true is it that theoretically it could be realized by half of them dying immediately and the other half dying at the expiration of a number of years equal to twice the expectation of life. It is also true theoretically that the range of the mortality may vary, back and forward, between these two theoretical possibilities, which, of course, are neither of them practical possibilities. In other words, expectations of life which are approximately the same might be produced by influences at work which were not at all the same, the only requirement being that the effect in one community is counterbalanced by an equally potent effect in the other community.

Notwithstanding these patent defects, the expectations of life deduced from properly constructed tables or from data properly distinguished according to (a) race, (b) sex, and (c) age, for each community under observation will, of course, be of the highest utility as showing how on the whole the complex of influences at work in each group affects the average longevity; but even in such case it will be necessary in order to observe precisely how these influences operate, to compare the actual death-rates for individual ages or, which may be more convenient, at small groups of ages.

The most valuable, therefore, of all the various things which might be rendered available through the use of population life tables is life tables themselves showing the mortality at the various ages and affording means of comparing the mortality as affected by location, race, sex and occupation. The one additional requisite to render such statistics of the highest value to those interested in the work of the American Health Association is that the causes of death should also be studied. In other words, if we can know first at what rates and through what causes, distinguishing as to the influence of each cause, those die who are shown by the data collected to be engaged in occupations which are not

hazardous we may then by comparing the deaths among persons of the same locality, race and sex engaged in occupations found to be hazardous ascertain not merely the degree of the excess mortality but also the causes for this excess.

Armed with such information, it will be possible to work with intelligence and concentration upon two problems, first, the reduction of mortality among those found not to be exposed to special occupational hazards by the elimination or frustration of causes traceable to heredity, unsanitary conditions or bad customs from the standpoint of hygiene and, second, the improvement of occupational conditions looking to the elimination or great reduction of the special perils to which those engaged in the several occupations are exposed. Without this information, collected and analyzed with as great a degree of accuracy as possible, we shall certainly not be in position to bring to bear upon these problems that intelligence and concentration which would surely be most effective; but, instead, we are likely to be firing volleys into the air and attacking the lesser evils as if they were the greater and failing to appreciate how with the greatest economy of effort we could produce the most valuable and lasting results, if supplied the means to do so.

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RURAL OBSTETRICS.

Figures showing that at least 15,000 women die each year in this country from causes connected with childbirth; and that about 7,000 of these die from childbed fever, were quoted by Doctor Meigs, of the Federal Children's Bureau, Washington, in a paper on the care available for the mothers in rural communities, at the recent Seventh Annual Meeting of the American Association for Study and Prevention of Infant Mortality, in Milwaukee.

"Unlike the death-rates of other preventable diseases which show year by year a steady fall," states Doctor Meigs, "the death-rate from conditions connected with childbirth is not decreasing. For 13 years the official figures can show no fall in this rate; during the same time the death-rate from typhoid fever has been cut in half, and that of diphtheria decreased to less than half. These facts show that there is great need for improvement in the care of women at childbirth in this country. We know that women living in country districts in the United States have in general very inadequate care at this important time. This is partly because in many such places pioneer conditions still prevail; in the bare struggle for existence many necessities of life have to be foregone. It is also due partly to the fact that in the country, as everywhere, people fail to realize the extreme importance of good care at this time of a woman's life; the fact that the money expended for adequate care at this period is the most necessary part of the family budget.

"The Children's Bureau has, during the past year, made studies of the care of women at confinement in rural districts in two states; a northern state, Wisconsin; and a southern state, North Carolina. These studies show widely varying conditions; both, however, show that in many regions women in the country have no skilled supervision during pregnancy, no nursing care before or at labor, no attendant at confinement but a neighbor or relation. Women die, or become permanent invalids through such lack of care.

"A county unit plan may be worked out including a county hospital providing for normal and complicated cases of confinement; nursing service with supervision of women during pregnancy and nursing service at confinement; and skilled attendance at labor."

THE VALUE OF ISOLATION HOSPITALS FOR SMALL CITIES.

CHARLES S. CAVERLY, M. D.,
President, Vermont State Board of Health, Rutland, Vt.

Read before a General Session of the American Public Health Association, Rochester, N. Y., September 10, 1915.

Doctor Caverly is in charge of the public health in a state of small cities, but nevertheless a state in which public health work is conducted along very advanced lines. In this paper he reviews the present situation and points out some of the advantages of the isolation hospital and suggests how rural communities can best proceed to secure one.

MY ACCEPTANCE of the vice-chairman's invitation to speak on the Value of Isolation Hospitals for Small Cities is prompted by what has seemed to me to be a need, rather than because of any special experience I have had with such hospitals.

Most of the larger cities have recognized the usefulness of these hospitals and provided, more or less adequately, hospital care for certain contagious diseases, especially smallpox, diphtheria, scarlet fever, and tuberculosis.

As far as I am able to learn, modern or even comfortable and passably well-equipped hospitals, for the care of these diseases, in rural districts and villages and in small cities of less than 25,000 population, are very exceptional. From correspondence with a few states, taken at random, and representing all sections of the country, these facts were elicited:

There are no such hospitals in this class of cities and towns in New York, with the possible exception of Ogdensburg (Sec. State Board of Charities); none in New Hampshire, with the exception of Concord and Berlin (Sec. State Board Health); none in Connecticut, except at Greenwich and New London (Sec. State Board Health); none in Florida, except one operated by the State Board of Health at Miami (State Health Officer); none in Louisiana, except isolation wards operated in connection with a general hospital at Shreveport (Pres. State Board of Health); none in Ohio (Sec. State Board Health); none in Washington (Health Commissioner); none in California (Sec. State Board Health). The situation in two states is significantly stated thus: In Rhode Island, the secretary of the State Board of Health says: "The only towns which I know of as having isolation hospitals, which are 25,000 or under, are Newport and Pawtucket. Two or three other towns have buildings isolated in the country, which can hardly be called anything but shacks." The secretary of the State Board of Health of Indiana gives a list of nine small cities in that state having or having had isolation hospitals, with this comment:

"Some of these isolation hospitals were simply tents, or partly board and partly canvas.

"In several instances these structures have been burned after small pox has subsided.

. . . "Several other towns have had abandoned or empty houses on their outskirts for detention or isolation hospitals in emergencies."

The experiences of Rhode Island and Indiana, I imagine, represents the experiences of many other parts of the country.

The State Department of Health in Massachusetts, acting under statute, is seeking to secure such hospitals in the smaller cities and larger towns. The Massachusetts law reads in part as follows: "Each city shall, and each town may, and upon the request of the State Department of Health, shall, establish and maintain hospitals for persons having smallpox, diphtheria, scarlet fever, tuberculosis, or other diseases dangerous to the public health as defined by the State Department of Health" with the proviso, that if an arrangement can be made that is satisfactory to the State Department of Health, between cities and towns for the care of such cases, it shall be considered in compliance with law. The cities of Northampton and Clinton have such hospitals and others are under construction or have submitted plans at Adams, Greenfield, Gardner, North Adams and Marlboro (Director Division Communicable Diseases, State Department of Health).

The Vermont law allows towns to combine for purposes of caring for these contagious diseases. The only city having such a hospital is Rutland though several others have now taken steps to provide them.

Modern hospitals, then, for the care of this class of diseases, are exceptional in our smaller cities. Those most recently constructed are connected with general hospitals. The case of Evanston, Ill., seems to be a good example of this.

In our campaign against the contagious diseases, we aim to confine the specific organisms, their cause, to the narrowest possible limits; and to this end we seek to control the movements of the human sources of these organisms, as well as any possible distributors among insects, animals or inanimate objects.

We are learning to attach more and more importance to the human source, the human culture-tube, the case itself. It is the *case* of sickness that is chiefly dangerous. In other words, the contact diseases are spread chiefly by human beings who are either frankly or mildly sick or who are carriers. Inanimate objects, fomites, in most diseases are comparatively harmless, though insects and animals in certain instances must be reckoned with.

In the common contact diseases with which most of our municipalities have to deal, like smallpox, diphtheria, scarlet fever, infantile paralysis, epidemic meningitis, typhoid fever and measles, we institute a house quarantine, as they are reported. This quarantine, in actual practice, differs somewhat in different localities. In most cases it shuts up, under one roof, the sick person, and all persons and things that have been in contact with him.

This quarantine not unusually in-

cludes the wage-earner, and quite regularly school children and others. A barrier is put up between persons and things in, and outside, the infected premises; all this often without regard to size of house or number of inmates.

It is not necessary to dwell on the awkwardness of the situation thus created. Secondary cases, expense to family or city, and a natural feeling of resentment against all health regulations are apt to result.

House quarantine is at best cumbersome, unscientific, and too often ineffective. When several cases of any of these diseases suddenly develop in a small community, it is quite apt to give rise to panic: Hospital facilities are then often demanded and quickly. In the emergency some building, unoccupied, away from near neighbors, and cheap, is hastily secured, a "hospital" improvised, and in this the sick are segregated.

This is, and has always been, the situation and practice in most of our towns and small cities, especially with reference to smallpox.

If facilities for the prompt removal of each case of diphtheria, scarlet fever, smallpox, meningitis, infantile paralysis or even typhoid to a *suitable* isolation hospital were provided, several most desirable ends would be served.

From the private citizen's point of view, the length of time of the house quarantine would be reduced, the breadwinner would be released, and the restrictions, social and school, would be shortened. From the standpoint of the public, one focus of infection would be substituted for several, perhaps many, and the cost of maintaining many separate quarantines would be reduced.

Most of the larger cities, like the English or other European cities, with their greater needs in crowded housing conditions and their greater resources have provided hospitals for these diseases.

Our smaller cities and rural communities have rarely provided for this need. There are few small cities of 10,000 to 25,000 population, which have no crowded tenements, no slums, in which the appearance of any of these diseases does not point to epidemic conditions, under house quarantine.

Smallpox has ever been the most feared disease in all our communities. Many of our New England towns and cities, and the same condition apparently obtains elsewhere, have a building, little better than a barn or shack, perhaps an abandoned house, located in some remote section, in uninviting surroundings, lacking not only hospital equipment, but frequently the furnishings necessary for comfort, to which the luckless victim of smallpox is unceremoniously removed. This place is known as the "pest house." Lacking such facilities, a costly house quarantine, enforced by special guards, is instituted.

Smallpox, the once-fatal scourge, against which our first public health laws were enacted, has, for a century and a half, been the one disease which public sentiment has permitted to be dignified with special hospital facilities—such as they are. So the only isolation hospital known in most of the smaller municipalities and rural com-

munities is the "pest house," an institution to be dreaded as much, because itself cheerless and comfortless, as the disease which sends one there.

There may conceivably be objections raised in the public mind against any hospital treatment for contagious diseases. With the uninitiated, especially in small places, all hospitals are apt to be unpopular. This feeling is in part a legacy from "pest house" days.

The public, however, on better acquaintance, learn the advantage of general hospitals, and become reconciled to their use. When "pest houses" give place to well-equipped, and well located isolation hospitals, they will not only be tolerated but demanded by the public.

Herein lies opportunity for missionary work by health officials.

The time-honored custom of consigning isolation hospitals to remote, unfrequented sections of a city or town should be abandoned. Indeed the apparently growing practice of locating these hospitals near, and as a branch of general hospitals has decided advantages.

As our knowledge of the methods of spread of contagious diseases grows, we are coming to know that an isolation hospital may not be an altogether undesirable neighbor. The location of an isolation hospital in a desirable residential neighborhood, or even near a general hospital, formerly met strenuous objection. The location of isolation hospitals near to general hospitals has these advantages: the technical equipment and the kitchen of the latter may be utilized under proper restrictions, and the nurses may be both utilized and given needed instruction in this class of diseases.

The need and value of isolation hospitals in small cities and rural villages vary somewhat with local conditions.

Industrial communities, employing largely young men and women, having a large boarding house population; or such communities using foreign and cheap labor with the living conditions which often go with this, have special needs in this direction. Likewise educational towns, with boys and girls living in dormitories and boarding houses, need the facilities offered by these hospitals. A recent personal experience, in a college town, in which a case of infantile paralysis developed in a boarding house occupied by college girls emphasized this need to me. The difficulty of properly isolating the five or six contacts, in a private house, without risk of further exposure, and under panicky conditions, is not to be lightly regarded.

Under such circumstances an isolation hospital would relieve an awkward situation at minimum inconvenience and cost.

Rural sanitation is just now the subject of comment and criticism. In some states, like my own, with no large cities, it is rural conditions chiefly with which we have to deal.

It is obviously impractical to expect farming towns and villages to support *isolation* hospitals any more than *general*.

The laws of Massachusetts, cited above, offer a practical solution of the rural situation. The town govern-

ment is the rule in New England. The county is the unit of local government in a large part of our country. County *general* hospitals are advocated and even in use, I believe, in some states. The plan of county isolation hospitals naturally belongs to the plan of whole-time county health officers.

When rural towns may legally combine for operating isolation hospitals or rural counties may do this legally, an important step will be taken toward the sanitary redemption of our rural communities. Suburban towns to cities having general hospitals with isolation wards, or independent isolation hospitals, may arrange for the care of contagious cases in these institutions.

While the problem presented is quite different in the small city and rural town and more difficult than in the larger city, the need is as evident.

As far as I am able to learn, no sufficient observations, extending over a considerable period of time, are available to base definite conclusions on, as to the practical value of these institutions. A study of the mortality and morbidity statistics of the town or city, before and after, would be of first consideration; the financial showing should be secondary.

Theoretically, from either viewpoint, permanent and adequately equipped isolation hospitals are worthy wider use than is now made of them.

Summary.

Real hospitals for the care of contagious diseases are exceptional in small American cities and rural communities.

The control of outbreaks of contagious diseases usually resolves itself into the control of persons.

One well-guarded focus of disease is better than many, unguarded or loosely guarded.

Isolation hospitals are not "pest houses."

Isolation hospitals or wards might to the advantage of all concerned be connected with general hospitals.

Industrial and educational centers especially need the facilities of these hospitals.

Rural communities should combine in support of isolation hospitals, by towns or as counties.

CHANGES IN BUTTER DURING COLD STORAGE.

The causes of rancidity in butter have frequently been investigated by chemists and bacteriologists. Recently the causes for the undesirable flavors sometimes present in cold-storage butter have been sought by dairymen, storagemen and hygienists. It has been generally supposed that rancidity is due to changes taking place in the fats of which butter is principally composed and that the "off-flavors" are merely mild forms of rancidity. After a series of studies on butter which had been prepared under widely varying conditions and stored at 0 F. for varying lengths of time, Dyer concludes that (*a*) the development of undesirable flavors in storage butter is not dependent on an oxidation of the fat itself; but that (*b*) it is attributable to a slow process of oxidation progressing in the non-fatty constituents of the buttermilk, and that (*c*) the extent of this change is directly proportional to the amount of acid present in the cream from which the butter had been prepared. In other words, the buttermilk supplied the substances which decompose during cold storage and this decomposition is proportional to the amount of acid present in the cream before churning. The experiments showed that butter made from sweet cream had a very mild flavor and kept in good condition almost indefinitely in storage, while the butter from high acidity cream had a high flavor but would not keep well. The remedy consists in preventing the cream from ripening too much, *i. e.*, producing too much acid before churning or, if that has occurred, in washing out the buttermilk from the freshly churned butter with fresh water.—*Journal of the American Medical Association.*

PUBLIC HEALTH WORK THROUGH THE PRESS IN NORTH CAROLINA.

WARREN H. BOOKER, C. E.,
Chief of the Bureau of Engineering and Education, North Carolina State Board of Health.

Read before the General Session, American Public Health Association, Rochester, N. Y., September 8, 1915.

The Journal is presenting this year a number of articles on the educational side of health work. We believe that our readers are finding these articles both interesting and helpful. The educational work of the North Carolina department is well known. This paper by Mr. Booker is therefore one of the valuable contributions to this group of papers.

PRINTER'S ink is blazing the trail for public health work in North Carolina. Yea, it is doing more than that. After the trail is blazed it is printer's ink that levels off the grades and removes many of the obstacles in the road of progress and advancement. Once the way is opened it is printer's ink that keeps it open. It is printer's ink that turns on the gas, that advances the spark, that throws in the clutch and that steers nearly the whole public health machine.

That we may compare mileage, study designs, discuss attachments, exchange experiences and borrow ideas from more experienced drivers is the object of this paper.

DEVELOPMENT.

The first experiment in newspaper health work in North Carolina was begun in 1910 when a series of short articles on health subjects was sent to the press of the state. This original experiment was not altogether the success it was hoped it would be and after a few months the scheme was discontinued.

In October, 1911, after further study and conference with newspaper men, it was decided to again undertake the experiment of issuing weekly free health material to the press of the state. Accordingly, for a year or more regular weekly articles were mailed to all the papers of the state indiscriminately.

Frequently, more or less promising "leads" or "news" stories presented themselves during the week and so irregular health articles based more or less on news items began to appear at the rate of from one to four or five articles a week.

As an increasingly large amount of the material sent out was finding its way to the printed page in quite a number of the papers, it was decided about a year ago to issue regular daily articles six days a week instead of the irregular articles. There are only about thirty daily and about 225 weekly papers in North Carolina. On account of the cost of postage these

daily articles were sent out each day to the thirty dailies and on Saturdays an entire set of the six daily articles for the week were sent the 225 weekly papers.

Some of the weekly papers registered a complaint, and with just cause, to the effect that the dailies always received the material first. To promote the general cause of peace and harmony among the weeklies, a special weekly article was sent the weekly papers but withheld from the dailies. The latter plan has been proving very satisfactory indeed, as complaints have ceased and as we find that the weekly papers take liberal advantage of the special weekly articles and occasionally use one or more of the daily articles that have already been furnished the daily papers if their space permits and their fancy dictates.

The next step in the development of this newspaper health work has been the issuing of free plate material, or "boiler plate" as it is sometimes called, to fifty of the largest papers of the state that will agree to run such material.

This plan appeals very strongly to the smaller papers, especially the county weeklies where the cost of composition or typesetting is such a considerable item. This plate material is sent out at the rate of a six column page every six weeks with a column released each week. This plate material, of course, does not take the place of the daily news articles, which we still send to the daily papers. By means of sending free plate material to the small county weeklies and others where composition is quite a factor and daily articles containing health news to the dailies, where news is the chief factor, it is possible to cater to the wants of both classes of papers.

Mistakes and Experience.

Such, in brief, has been the development of newspaper health work in North Carolina. What turn it will likely take in the future we will not at present venture to predict. That mistakes have been made, and are being made, goes without saying. In some instances we have profited by our mistakes, but it is a long, long way to perfection in almost any line and we have yet very much to learn and perfect.

It was early learned that a reasonable compromise had to be made between what we should have liked to have had published and what our friends, the newspapers, would publish. As publication was voluntary and without pay on the part of the newspapers the compromise was usually very largely in their favor. We soon began to learn, also, that their judgment as to what would and what would not be read by their readers was superior to ours. The mere publishing of a lot of material which practically no one ever reads is just so much lost motion.

In this work it is comparatively easy to judge when one is hitting the bulls-eye. If our friends, the newspapers, publish the material sent them, we assume that it either approximates what they like, or else that there is a dearth of big news and they are obliged to use our material in the absence of something better. If they

do not publish it we assume that it is because it is not the kind of material they want, or else it is because their columns are already filled with news of *Titanic* disasters, European wars, Zeppelin raids, or political squabbles.

For a writer to ascertain the trouble with his own articles that are not meeting with the desired success in the absence of big news or other obvious space fillers is not usually an easy task. Recognizing that "our best friends are those who tell us of our faults and help us to remedy them," we turn with the utmost frankness and confidence to our friends, the newspapers themselves, and ask them for criticisms and suggestions as to how we can improve the value of our service to their paper, and we never fail to get that for which we ask. Time and space forbid more than enumerating some of the little pitfalls we encountered and some of the little helps we have found. We merely offer a few of them for what they are worth.

For the daily newspapers, news and news while it is news is of prime importance. To plunge into an article and set forth the advantages and desirability of a county hospital, or sanatorium for the treatment of tuberculosis, does not bring the newspaper response nor attract the reader nearly as much as the announcement that county "A" has made a certain appropriation for a tuberculosis hospital while the death-rate from tuberculosis in that county is already lower than the average in the state.

Again, news articles must be short and to the point. This is a busy age and few people have time or patience for long drawn out articles. A news paragraph of from one to two hundred words or less will usually serve the cause of public health better than the same article drawn out to four or five hundred words.

Few people read newspaper articles entirely through. Practically everybody, however, reads the headlines and a great many read the first sentence or two. Watch your own reading and see if you do not do it, too. Fiction or a magazine article may have the climax at the end but a news story must have it in the headlines and in the first sentence. The remainder of the news item may be a rapid enlargement with details arranged for an easy deduction, but no editorial comment is permissible unless perhaps some one is quoted as in an interview. Editorials and news items do not mix well in the same article.

Human interest material is splendid and should be woven in wherever possible. News stories of babies and children are of more interest than stories of women, and stories of women attract more attention than stories of men. Witness an auto accident in which a little child is run down, another in which a woman is injured and a third in which a man is killed. It is the little child and the woman that draw the headlines while the man is usually mentioned in connection with the widow and the children he leaves behind. The same thing is true with diphtheria in a school and tuberculosis in a factory.

In a certain class of articles local coloring is highly essential. In North Carolina our readers are not so much

interested in knowing about the tuberculosis death-rate in the United States as they are about the rate in North Carolina. Furthermore, it is far more interesting to know that in some health particular that town or county "X" has the highest or lowest rate in the state or that town or county "Y" is second, than to know similar facts as regards states or nations.

Of course, it goes without saying that newspaper health articles should be nontechnical and written with the reader and the purpose of the article kept steadily in mind at all times.

In articles for weekly papers where the news feature is not quite so important, the headlines and first sentence are of even more importance than in news articles for daily papers. In such articles the first sentence should frequently be short and full of "pep, punch and vim." It should be designed to attract attention and to hold interest—in short, to make the reader want to "see what the piece is all about, anyway." An unusual presentation or a "rich, rare and racy" style of treating some important, but perhaps unpopular or threadbare, subject will frequently secure attention from both the editor and the readers, where plain, straightforward statements about the same subject might fail to interest.

Cost.

The cost of newspaper health work should not discourage anyone to whom such a field is available. Where weekly articles alone are issued the cost per week should not be over $2.00 or $2.50 for the first one hundred papers served and about $1.50 for the second and subsequent hundreds. This estimate is exclusive of any charge for editorial service.

Where such newspaper health service is undertaken it will generally be possible to eliminate the editorial item of cost as this can usually be carried on with other educational work or as a part of the regular office routine.

Where daily articles are sent the daily papers the cost for printing, postage, stationery and mailing should not exceed $2.00 per day for a service to fifty daily papers.

Plate material, exclusive of editorial service, costs $1.50 per six-column plate delivered to the newspapers in lots of not less than fifty papers. In other words to supply fifty papers with a column of free health material each week, set up in type and ready to run on the press, costs twenty-five cents per paper.

Results.

It is difficult to determine either the direct or the indirect result of this newspaper educational work or health propaganda as carried on in North Carolina. Only approximate figures are available as regards the circulation of many of the papers of the state and only about a fourth of the total number of papers published are received on the exchange desk. However, from questionnaires to the editors, from the papers themselves and other sources of information, it appears that the total circulation of the daily papers is approximately 140,000 and that they use about 20 per cent. of the daily articles sent them, while the total

circulation of the weeklies of the state, exclusive of trade, technical, literary and other publications that could not be expected to use health material, is approximately 600,000, and it is estimated that they use at least 15 per cent. of the weekly articles sent them. The full significance of these figures is better understood when it is remembered that there are only about 400,000 homes in North Carolina. Of the papers receiving free plate material, approximately 75 per cent. of the material is thought to be used. While these are only the roughest kind of approximations, who will venture to measure the value of small daily articles on public health and personal hygiene appearing in a fourth or a fifth of the daily and weekly papers circulating throughout the state where none have appeared before? It is the continual dropping of water that wears the hardest rock, just so we believe it is the continual hammering on this matter and keeping it before the public that is blazing the trail for public health work in North Carolina. As the newspapers are the text-books, the public schools and perhaps the greatest single source of information and education for nine tenths of our adult population, if we would introduce a course in public health instruction to this all important class of tax payers and voters, we must do it through the public press.

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ARSENIC IN "CHEMICALLY PURE" ZINC.

In a study, by means of the Marsh test, of the arsenic content of various body fluids after the injection of salvarsan and arsenobenzol, it became necessary to secure a new supply of metallic zinc, the old supply, which had been proven to be arsenic-free, having been exhausted. Eight samples, which purported to be chemically pure, were examined. These all contained arsenic, though the statements on the labels indicated freedom from this element, the following designations being used: "As, Nil"; "As, none." Even after specifications were submitted requiring arsenic-free zinc, samples of impure zinc were received. The analyses which were being made dealt with amounts of arsenic varying from 1 to 7 parts per million; whereas in 10-gram samples of zinc, marked as previously indicated, amounts varying from 10 to 100 parts of metallic arsenic (1 to 10 parts per million of zinc) were found. The statements on the label of each of these samples indicated that the zinc had been analyzed and found to be free of arsenic. The control tests were carried out with 40 grams of zinc and four times the amount of sulphuric acid used in testing the zinc samples. In no case was any trace of arsenic observed. However, this is no indication that there was no arsenic present in this control sample. It does mean, however, that arsenic was not present in amounts as large as one part per million in 40 grams of zinc, since the procedure employed was capable of detecting amounts as small as this.

During the past two years, conditions have forced the manufacturers of chemicals to meet extraordinary demands. Those who use their products, either in the manufacture or the analysis of foodstuffs, should see to it that those chemicals and reagents are not contaminated; of this fact the label is not always sufficient or final evidence.

While in medicolegal examinations it is customary to control all procedures most rigidly, and doubtless chemists doing this kind of work always take proper precautions in regard to the purity of their reagents, this note is intended to call the attention of analysts in food, drug, and public-health laboratories to the necessity, when arsenic is being sought, for examining all chemicals for themselves, irrespective of the fact that they are using "analyzed" chemicals.—Chester N. Myers, *U. S. Public Health Report*, Oct. 6.

URBAN AND RURAL CONTROL OF THE FLY PROBLEM.

L. M. McCormick,
Asheville, N. C.

Read before the Public Health Administration Section, American Public Health Association, Rochester, N. Y., September 10, 1915.

IN THE beginning was the fly—at least his fossil remains, found in the lower Cambrian rock, indicate that he was one of the very early inhabitants of our globe, and the fact that he has survived under the changing conditions that have thrown into the discard the long series of fishes, reptiles, birds and animals that make the geological history of the globe as fascinating as a fairy tale ought to have made us just a little cautious when we decreed his extermination some ten years ago.

How easy it was to say in our pride, "Git off the earth—I hate you."

"If hate killed men, brother Lawrence,
God's blood, would not mine kill you?"

Perhaps Emerson was thinking of the fly when he wrote:

"If the red slayer thinks he slays
Or if the slayer thinks he is slain
They do not know my dubious ways,
I turn and pass and come again."

Fabre, the great French naturalist, after a life-long study of insects, says somewhere in his memoirs, of the intimate, interesting studies of insect life he made, "You will never control our insect pests, for insect life flows through the animal world like water through the soil. To eliminate one, you have to destroy the other."

But this pessimistic view was not that of L. O. Howard, our honored chief entomologist of the Agricultural Department, for he remarked in his insect book, more than ten years ago, "If we could only get our boards of health in cities to attack the house-fly question and to insist on the proper disposal and keeping of horse manure, the insect would soon become scarce."

Asheville claims the distinction of having been in the front rank of modern fly fighters and is believed to be the first city to pass and train an ordinance directly and specifically against the house-fly, and we have found the joker in this modest challenge of Doctor Howard's to be in the "proper disposal and treatment."

Now, the proper disposal and treatment of manure from the standpoint of the health department sounds simple, and probably any one of the various methods that have been proposed and advocated would be effective under an autocratic government, or one wealthy enough to apply its own remedies. But under working conditions of the city, where the problem is complicated by the conflicting interests of the horse owners of various grades and conditions, and the public at large, the control of the house-fly resolves itself into an educational problem, which involves the life-long and hereditary habits of the horse owner and caretaker, as well as the habits of the

fly in his various stages of development, and the interests of the dining-room, kitchen and sick chamber.

Familiar as the house-fly has always been, the breeding habits have been so diabolically masked by the offensive material chosen for the rearing of the young, as well as the uninteresting neutrality of the species, that even our naturalists had overlooked several very important factors in the life history of the fly, or did not, at first, give them due consideration as elements in the problem of control.

Briefly these are:

First, the moral certainty that all manure dropped in the stable in summer time is fly infected before it can be cleared away under the ordinary and practical conditions.

Second, the remarkable ability of the young imargo to reach its "place in the sun," even though barred by seeming impossible obstacle, when it first breaks its chrysalis.

When the imago first crawls out of his pupal case, he has his wings bunched up out of the way in tight knots on his shoulders, his body is as pliable as india rubber and he has full-grown active legs. This is, for him, a most critical period of life. If he finds himself in a tight place, he must get out or die, and his ability to get out is worth studying; if his pupal quiescense has been taken advantage of to plow him under ground, he will dig his way up to light and air; if he finds himself in a test tube, with too many companions for the air, he will squeeze past a tight cotton plug; if he is in a screened manure bin, and the air is bad, he will work his way through any crack that lets light pass.

Third, in the migratory instincts of the larvæ, which teach it to seek a safe retreat in which to pupate.

The tremendous feeding ability of the larvæ which enables it to increase its bulk more than 100 per cent. every day of its growing period, the time limit of growth, minimum five days, and the dependence of the larvæ on a liberal supply of food and air for its successful growth, are other features to be duly considered.

The failure to give due weight to the first two factors mentioned was responsible for the screened manure bin fallacy, which from its very plausibility, has, in my opinion, been the cause of more anti-fly work failure than any other one thing.

Hardly an ordinance or regulation that has come to my notice but has contained this pitfall.

A screened bin or pit cannot be constructed without sacrificing facility for the removal of contents when necessary. The result is that the screened pit is never thoroughly cleaned and the remnants left behind are only too sure to be a practically pure culture of larvæ and pupa, from which eventually emerges flies to discredit the work.

Some writers have held that this failure exploded the idea that flies could be prevented from breeding, and have urged trapping of the adults as the only remedy left, have started campaigns of swatting, with prizes and banners, that could only result in diverting the available funds, interest, and work from profitable channels.

Traps and fly poisons are usefu l

makeshifts only, and are about on a par with oils as a mosquito eradicator,—temporary bridges to be discarded when the permanent cause, the breeding places, are eliminated. Their presence as a municipal weapon in a community mark that low level of civic conscience where the indifference of the stable owners is allowed to impose on neighborhood rights.

Larvæ traps are most interesting experiments, and might be available as a municipal weapon if we could depend upon a sustained, intelligent interest of the owners to keep them in working order, and prevent them from becoming mosquito breeders as well as fly breeders; but they have always seemed to me to be too cumbersome and to possess too dangerous a recoil to be recommended as a fly protective measure under ordinary circumstances. However, I hope that Doctor Levy and others who have tried them may discuss their merits further.

Larvicides such as borax, Paris green, and the phenal oils seem to be more hopeful methods then the maggot traps, and have, under my observation, proved very effective, when faithfully and intelligently used. Taking into consideration the very active appetites of the maggots, comparatively little poison is needed, if properly applied, to render the manure pile safe. To be effective, however, whatever larvicide is chosen must be applied to the fresh manure, as a part of the day's routine work.

"Once a week" application or several days apart are futile. As a municipal weapon, these fail because of the uncertainty of the human factor in the application, and the impracticability of detecting a failure on the part of the stable men to have used them the week before, has caused me to distrust them as a public measure.

But I recommend them freely to individuals who can control their environments, and I have had satisfactory reports from several experiments where they were used intelligently.

At the Biltmore Dairies near Asheville, where about twenty horses and one hundred and fifty cows are kept, Paris green has been used for three years in the horse stables, with satisfactory results. However, this phase of the house-fly control has been so admirably worked out by the U. S. Department of Agriculture, Bureau of Entomology—Cook, Hutchinson and Scales, and made available in their bulletins 118 and 245, that I will not go into details here.

Borax and hellebore are the substances recommended, and when the farmer wakes up to the false economy of letting the fly maggots destroy 25 per cent. or more of one of their most valuable by-products, the horse manure, for lack of a little of the bug poison that they use to save their potatoes and cabbages (which they use the manure to grow), there will be fewer flies on the farm.

I think the first and most important factor in a plan for controlling flies in a town is inspectors, who, by actual observation and breeding experiments, know their flies and all their funny little ways from egg to old age. This should be learned in field work—it can hardly be taught by precept or print. Let the inspector learn how to find the

fly eggs in the manure pile and in the horse stable; how and where to look for maggots, chrysalis and new imago, and with the proper start, he can and will, if he is worth his wages, be able to drive home to the stable owners, the maxim that flies in any neighborhood mean that fly-breeding material (which in a vast majority of cases is stable manure) has been neglected in that locality more than ten days that there is no "royal road to freedom from flies" and that *Clean up and keep clean* is the winning war cry.

Next in order of importance to inspectors come the education of the stable keepers and reformation of the stables. When the man responsible for the condition of the stable learns the life history of the fly—recognizes the eggs, maggots and pupa when he sees them—has found the pupa under an inch or two of soil yards away from the manure pile that he thought had been cleaned up, he realizes the reason for our regulations and can usually be counted on as an active ally, rather than an abused and sullen victim of the crank notion of the health department.

Men are but children of an older growth—and the real thing always appeals, so it is well worth while to arrange a fly-breeding demonstration for the public. One of our principal hardware stores trimmed a window with screens, fly traps and swatters—used our posters and a glass jar containing maggots, and another containing stable manure with ripe pupa. This was placed inside a large bell glass. This window attracted crowds who watched the bell glass from day to day. This window show made more citizens "clean up" converts than anything else we ever did.

A stable which cannot be thoroughly and easily cleaned is a hopeless handicap to anti-fly work. Washington, D. C.'s regulation that all stables shall have floors that are made of waterproof material is most excellent. The objections that the hard cement floors are bad for the horses is not borne out by the evidence of the stable keepers in Washington. For the stable men there told me that if a horse stood on dirt with his fore feet, a concrete floor for the rear of the stall did not lame the animal. But any stable, even if it has a dirt floor, can be drained and kept dry, thus adding to the comfort of the horse and the facility of cleaning.

In Asheville, for reasons indicated above, we have discarded the screened manure bin and insist that each stable shall be provided with a standard bin, built with the main idea of ease in cleaning, and protection of the soil in or near the stable from manure contamination. Our standard type is a bin 4½ feet wide, 8 feet long and 2 feet deep, with one end left out; all bracings and cleats to be on the outside, leaving a smooth clear floor and sides that can be swept clean when the manure is removed. All manure made each day must be put into this bin for storage, and the stable floor and bedding must be kept clean and dry.

All manure must be removed from these bins and the bin thoroughly cleaned at least once a week. All manure must be taken out of the city during fly time and our citizens are discouraged legally and by public

opinion from using horse manure on gardens and lawns in the summer time. No restrictions are put on such use between November 1 and April 1. Hitch lots are under police control and must be kept clean. Disinfectants, such as Paris green, borax and a soluble cresol solution are recommended, but we do not allow their use to take the place of the weekly clean up.

The large livery and boarding stables have found it more economical to load directly from the stables each day, than to keep a bin which involves double handling of the manure.

There are two or three points in the life history of flies which have a very distinct bearing on the fly control problem, that are difficult to answer definitely.

One of these is "How long does a fly live?" For all practical purposes in field work, we can put this item down as two weeks. Many observations in localities ignorantly infected by spreading fly-infected manure in a territory practically free from flies have convinced me that two weeks will see the finish of the "swarm" if no other infection occurs, and the same time limit is shown in the effect of a "Clean Up and Keep Clean" effort in a fly-infected neighborhood. We can promise that the flies will disappear in two weeks, if the motto is faithfully observed.

In breeding experiments, where several thousand flies were hatched on a given date in a large room, which was screened and ventilated and where food and water was supplied, 10 per cent. died the first week, 50 per cent. were dead at the end of the second week, and all but five were dead on the twenty-first day; all dead on the twenty-third day. But in this case, many natural causes, such as dissipation, and enemies, were eliminated. This observation, of course, applies only to the summer breeding habits.

The dormant stages and persistent long life of the individuals noted in the winter time is another story.

Doctor Howard in Farmer's bulletin No. 679 records the experiments of Bishop, Dove and Parman, who succeeded in two instances in keeping the species through the winter in the larvæ and pupa stages. It is certain that flies begin to breed very early in the spring. Young larvæ in a fresh manure pile can be found with the first peach blossoms and there are usually two or three broods before the "first flies" are noticed in houses, so that an early start for cleaning up the city is imperative for a successful season's work, and if, as seems probable, the flies are carried over the winter as pupa, concealed in the rubbish around the stable, an added cause is shown for a thorough renovation of the stables and surroundings very early in the season.

Another uncertain point is the range of flies. "How far will flies travel from their birthplace?" Individuals can undoubtedly go long distances. Those who have carried out experiments with marked flies sometimes recover their pets as far away from the base as a mile or more, but in field work, we have found that flies do not ordinarily travel in numbers more than two hundred yards from their breeding place, usually only as far as the first attractive residence or kitchen that will serve as their boarding house.

In the city, in our work, we have usually found the breeding place a neglected stable or perhaps an unsuspected pile of manure in a garden, where there was no stable within a hundred yards of the source of complaint, where the trouble lay in a territory that was cleaned up.

In the country, flies will follow up the odor of cooking a much longer distance, so that some flies will find their way to the kitchen for a quarter of a mile if the wind is right.

So much has been said and so well said about the menace of the fly that I will not further occupy your time. On that point our cleverest writers and cartoonists have found the pages of our most influential journals freely opened to their "song of hate"; but hate kills no one, not even a fly. It takes effort and persistence to reach the source of our evil. I do not wish to seem in this paper to belittle any phase of the work—the enemy is too persistent, and eternal vigilance is necessary to offset his persistence.

Swat the fly, swat him before he gets his wings—poison, trap, screen, but above all *clean up and keep clean*. And it is thoroughly worth while, we in Asheville believe.

Five years ago, there were eighty-nine cases of typhoid fever located in Asheville. Our campaign against the house-fly, reinforced by a campaign against the unsanitary condition of certain parts of our city, especially the unsewered places, and the open-backed privy, resulted in 1911 in reducing this number to 17 reported cases. In 1912 there were 8 reported, in 1913, 13 reported cases, in 1914, 12, in 1915 to the first of September, 2. We think this reduction worth while.

As typhoid may be considered the index of the health of the people we think that prevalence or absence of flies may be taken as an index to the fundamental cleanliness of the community.

And thoroughly reformed stables will set the pace for the rest of the premises.

Get clean stables and all other unclean spots will follow suit.

POLIOMYELITIS.

E. S. Rosenow, Rochester, Minn., E. B. Towne, Boston, and G. W. Wheeler, New York, report the results of their investigations as to the etiology of epidemic poliomyelitis in a preliminary note in the *Journal A. M. A.*, Oct. 21, 1916. They describe the organisms they have found in considerable detail. It is a peculiar streptococcus which they have obtained from throats, tonsils, and the central nervous system in cases of poliomyelitis. It has produced paralysis in animals of various species when injected into the brain substance, and lesions of the gray matter have been demonstrated. From the nervous system of these animals they were able to isolate this coccus in pure culture but not from their other tissues. It is remarkably polymorphic and seems to grow large or small according to the medium in which it is grown, even after passage through a Berkefeld filter With the large form of this organism, paralysis has been consistently produced in animals known to be insusceptible to inoculation with material from epidemic poliomyelitis as heretofore practiced. After paralysis had been produced in three rabbits the strain caused characteristic paralysis and lesions of poliomyelitis in monkeys. The authors do not attempt to give definite conclusions as to the relations of the organism to the etiology of poliomyelitis. It seems to them that the small organism which has been generally accepted as the cause may be the form taken by this organism under anaërobic conditions in the central nervous system and culture mediums, while the larger and more typical streptococcic form may be the same organism grown larger under suitable conditions. The article is illustrated.

SEWAGE DIGESTION TANKS FOR SMALL TOWNS AND CITIES.

G. EVERETT HILL,
New York, N. Y.

Read before the Public Health Administration and Sanitary Engineering Sections, American Public Health Association, Rochester, N. Y., September 7, 1915.

THE United States Census of 1910 records 226 cities having a population of 25,000 or more, and 13,759 incorporated communities with population of less than 25,000. A very considerable percentage of these smaller places are satellites of the cities—dormitories for the families of those who do business in the cities and who think in the terms of wide-awake well-informed city men. These men know the value of good roads and sidewalks, gas and electric current; they realize the necessity of an abundant and pure water supply; and they are now demanding, in increasing numbers, adequate and hygienic sewerage facilities.

More rural communities, roused by admonitions from state health authorities or stirred by a sense of sanitary guilt, are seeking better disposal for their wastes; and each village that instals a sewerage system starts two of its neighbors in the same direction.

But all of these lesser communities, suburban as well as rural, strive vehemently to keep down their tax rates and they usually succeed in doing it. The writer knows of one town of four thousand people, which has thirteen miles of roads most adequately cared for by a street superintendent who is perfectly satisfied with a salary of $400 a year. Their thrift is most commendable; but it often leads to the postponement of much needed sanitary improvements because the cost—particularly the cost of maintenance—threatens a considerable increase in a low tax rate which is their pride.

Under such circumstances an engineer must seek for every economy compatible with safety. Pumping of sewage must be avoided unless absolutely inevitable, and disposal works must be designed as free as possible from devices which require delicate manipulation or constant supervision. Usually suitable land is reasonably cheap, so that the more artificial and concentrated processes may often be profitably sidetracked for some form of soil filtration as the main factor in purification.

Economy and efficiency are both served by some initial treatment which will remove the bulk of the suspended matter before the purification of the dissolved impurities is undertaken. Coarse screening—enough to withhold the sticks, towels, aprons and other freight which a sewer transports regardless of its charter limitations—is always advisable; but fine screening involves too much labor and invites too much trouble if neglected. Sedimentation removes the solids, but keeps them all to be handled and treated separately. The digestion

tank withholds them equally well and automatically consumes a portion of them. It receives no salary for doing this; therefore it is to be recommended.

The older form of digestion tank—or septic tank, as it is popularly known—consists, per unit, of a single chamber, wherein the velocity of the flowing sewage is checked sufficiently to allow the sedimentation of the heavier suspended matter, which sinks to the bottom as sludge, and the flotation of the lighter soap curds and grease, which rise to the top as a scum, while the more or less clarified liquor slowly passes to the outlet end of the tank and is there drawn off, usually by some type of submerged or scum-trapped collector. The flow is continuous; the detention not overlong—eight hours is ample and safe; and the effluent passes to the filters or to its other destination with its dissolved impurities almost unchanged. The treatment thus far is sedimentation pure and simple. The retained solids, however, remain in the tank until attacked by anaërobic bacteria or by ferments (enzymes) produced by them. In this attack the organic solids are broken up, the less stable portions are liquefied or gasified, and these soluble products, as fast as made, *enter into and pass out with the stream of sewage which is constantly flowing over them*. This is the old-fashioned "one-story" tank, which has done yeoman service.

Developments in the art have indicated that certain distinct advantages accrue from the use of a "two-story" tank, in which the subsiding sludge passes through a gas-trapped opening into a tight lower chamber, where it becomes absolutely stagnant *and is not washed by the flowing stream of sewage*. In such a tank the clarified liquor is permanently freed from the burden of the suspended matter. No masses of sludge, buoyed up by decomposition-gases, escape with the effluent to load the filters—as happens in the one-story tank; and the liquid requires less oxygen for its ultimate purification than it would if it bore the products of the anaërobic decomposition that goes on in the bottom chamber of the tank. The sludge, when *thoroughly digested*, is much reduced in bulk and is practically inoffensive.

There is unquestioned evidence to show that the two-story tank may be made to yield excellent results, and there is ample justification for its adoption in certain larger installations where the business of sewage treatment is to be carried on scientifically by trained men; but the writer views with some disquietude what seems to be a popular fad for recommending and installing expensive tanks of the Imhoff type in communities which do not need them and will not properly care for them. Mr. G. M. Wisner, in his report on sewage disposal at Chicago, estimates the cost of an Emscher (Imhoff) tank, with settling capacity for three hours' flow, at $1.44 per capita; and the cost of a single-story tank, with capacity for six hours' flow, at $0.58 per capita, or only 40 per cent. as much. In many cases the difference in cost is much greater than this, particularly where a tank thirty feet deep is sunk in solid rock or in tide-flooded meadows as recently ob-

served. A two-story tank needs a depth of at least fifteen feet. A one-story tank will work well with eight, or even with seven. The difference in cost is heart-breaking when rock or quicksand is encountered.

Full conviction has not yet been borne in upon the writer that the destruction of sewage sludge is as rapid and complete in a shut-in sludge-chamber as in a simple one-story tank, where the flowing liquid receives and removes, as fast as made, the auto-toxins produced by the reducing organisms. Is it true that these agents are exempt from the wide-reaching biological law which decrees loss of energy or actual death to organisms that remain surrounded by the metabolic products of their own vital functions? We know that many bacteria, notably the pathogenic varieties, succumb to the toxins of their own making. Mr. Fuller has not hesitated to assert that "bacteria come within the scope of that rule, so generally applicable to living matter, that life comes to an end when the growing organisms are not freed in their surroundings of the products of their own growth." This belief has been reiterated in varying forms by most of the writers upon the subject.

Certain incomplete laboratory studies—unfortunately side-tracked by necessary absence, but to be resumed—indicate that after sewage sludge, shut in a closed container, has apparently completed its digestion, and no further change in character or volume can be detected, renewed activity within the sludge itself *and a further diminution in volume* can be secured by carefully displacing the supernatant liquor with fresh filtered sewage and maintaining a gentle flow which produces no apparent mechanical disturbance of the sediment. These studies must be repeated, under better conditions, before they are in any way conclusive; but this question is raised now in the hope that discussion may bring enlightenment.

Be this as it may, it seems to be an established fact that the two-story tank requires much more care than the simple one-story tank. An article, by an eminent authority, recently published in *Municipal Engineering*, prescribed the following rules of practice:

Care must be taken to see that alkaline sludge is secured.

The installation of a mechanical agitator (with power, of course) is deemed desirable.

Introduction of compressed air is also advisable.

Sludge should be withdrawn regularly and frequently.

The tanks when drained should be filled with fresh water from the municipal supply.

Lime or soda should be bought and added from time to time.

Very careful attention should be given to the securing of proper balance between upper and lower chambers.

Expert supervision is required.

Such care will not be prohibitive in installations that employ constantly one or more competent men for sewage treatment alone; but for the average small community—and it is for them that this paper is written—where the charge of the sewer system is simply made an added duty of the public factotum who is tax collector, street superintendent, dog catcher and chief of police, the best device seems to be

the foolproof thing that will work well if let alone.

As an illustration of what a single-story tank can do I cite the digestion tank at Wayne, Pa., which was put in commission September 26, 1907, and ran without any removal of sludge until April, 1915. Throughout this time it served on an average 3,200 people. Four thousand are now tributary to it, and the daily flow is about 450,000 to 500,000 gallons. The total solids it received in these seven years and seven months must have been about 1,200 tons. Of course this was not all destroyed in the tank. Much of it passed out in finely divided form and was caught by roughing filters, and some of it was detained by a secondary settling basin (an emptied roughing filter) tried experimentally; but neither roughing filters or sand-beds have ever been renewed (save for ordinary cleaning operations); and two sand-beds, out of a total of eleven with a combined area of 2.11 acres, still take the entire daily flow. The greatest mechanical removal of solids in this time has been the rakings from the sludge-bed which received the drainings of the roughing filters (and secondary settling basin) when these were thrown out of use for aëration. These rakings averaged two and one-half wheelbarrow loads a day. This digestion tank consists of two chambers side by side (a third is held in reserve) each of 85,000 gallons capacity. One is used until sludge ebullition becomes marked. This is then closed and the flow is diverted to the other.

Somewhat similar results were obtained with a simple tank at Mansfield, Ohio, which served 12,000 people and ran four years without cleaning. The sludge then ranged from two to three feet in depth, and it was removed only because an attempt to test the blowoff pipes showed that they were clogged.

Experience at Wayne and elsewhere seems to justify the employment of certain special features of construction. Brief mention of them may be interesting.

Each chamber is built with diverging side walls, so that the tank is narrow at the inlet and widest at the outlet end; and the effluent escapes over a smooth dead-level weir-wall (protected by a scum-retaining apron-wall) that extends all the way across the outlet end. Study of a tank of this type, side by side with one of similar capacity but with parallel walls, showed an apparent gain in sedimentation efficiency of 18 per cent., and a pronounced advantage—unfortunately not determined—in sludge digestion. The former is doubtless due to the reduction of velocity at the outlet end to a speed lower than the average speed through the tank, and the consequent withholding, first, of light flocculent matters which would be carried out by the average velocity, and, second and most important, of a part of the sludge buoyed up near the apron-wall by rising gas bubbles. The gain in digestive capacity is more obscure. It may perhaps be due to the lessening of bacterial antagonism by the approximate segregation in different zones of the many different kinds of reducing bacteria, preferring different foods and following the segregation of the lighter

and heavier solids deposited in different parts of the tank because of the sliding velocity.

Similar results have since been noted by Dr. Schmeitzner, who in his book "Clarification of Sewage" compares the efficiency of a tank at Sheffield, with parallel sides, and one at Viersen, with widening cross-section, and reports the removal efficiency of the former as 49.3 per cent. and of the latter (three tanks) as 82 per cent. Mr. Fuller, in his "Sewage Disposal" (1912), also approves of "a progressive increase in width of tank towards the outlet so as to reduce the velocity of flow."

The long level weir wall serves two important purposes: first, it ensures the withdrawal of the sewage (without increase of velocity until the weir is reached) from the whole end of the tank, thereby maintaining uniform flow from wall to wall; and, second, its length is so great that the escaping liquid creeps over it in a thin film, entirely too shallow to float even small masses of digested sludge. These, when they rise beyond the apron-wall, stop on striking the weir wall and are gradually washed away by the flow in such comminuted form that the individual particles are not visible, and slight momentary discoloration—like a faint streak of smoke—is all that is apparent.

Another item of proved value is a particular form of inlet, designed to "promote completeness of displacement" of the contents of the tank by securing uniform distribution over the whole vertical cross-section at the inlet end. This was adopted after studying diffusion with inlets of different types and depths in a glass tank filled with clear water, while the inflow contained fine sand, fine powdered clay and aniline dye.

Weir distribution of crude sewage is impracticable; for either the flow over the weir must be heavy enough to cause disturbing currents, or the solids will accumulate in the feed-channel behind the weir.

The inlet mentioned is made of cast-iron pipe. The flow drops vertically from the concrete feed-channel into an elbow set in its invert. This elbow turns from under the channel and delivers horizontally, through a nipple, into the side-inlet of a vertical tee. At the lower end of this tee another elbow carries the flow back under the channel and delivers it horizontally, about two feet under water, *against* the rear wall of the tank, which acts as a diffusion plate and spreads it in all directions before it begins its journey towards the outlet end of the tank. The effect can be readily seen by facing a wall at a distance of one foot and blowing against the wall a gentle stream of cigar smoke. These inlets are spaced under the feed-channel at intervals of about six feet, and the flow to each is simply and effectively adjusted by a series of concentric choke-rings placed in each hole in the invert of the feed-channel. With inlets of this character the distribution is very uniform and neither sludge nor scum is disturbed by the incoming sewage.

In communities where disposal works must lie below or at one end of the town, and where natural drainage

valleys are so very flat that a gradient sufficient for the maintenance of cleansing velocity in a gravity main sewer cannot be had, a well placed digestion tank will sometimes save a pumping plant and all the expense of its maintenance. For the tank can be placed in some central location, with short mains entering it radially; and the clarified effluent, freed from its burden of suspended matter and from the necessity of maintaining a velocity that will carry solids, may flow to the remote filter beds on a flat grade as slowly as it will, so long as it gets out of the way of the water coming behind it. By this simple expedient Southington, Conn., secured a gravity outlet for its effluent instead of pumping it.

Before long the two-story tank may be displaced by tanks for aëration with activated sludge, or for digestion under the stimulus of brewer's yeast; but these processes, though promising, cannot yet be considered as well established. In their present form they are certainly not applicable to the needs of the average village or town.

The sewage of one community varies so widely from that of another, and so many factors in the problems of sewage disposal are yet undetermined, that results from single-story tanks equivalent to those cited hereinbefore cannot be always assured. But it seems safe to say that for the majority of *small* communities the simpler type of tank is still reasonably efficient and more economical than its more pretentious offspring.

PLAGUE, A DISEASE OF RODENTS.

How plague may be present in rats without making its appearance in man is well illustrated by the experience of the steamship *City of Durham*. The history of this vessel emphasizes what students of the subject know must be true, namely, that throughout the world there are many ports infected with plague in which the presence of the disease is not known because human cases have either not developed at all or not in sufficient numbers to attract attention. Such ports in turn undoubtedly serve as foci from which the infection is carried by rats to ships and thus to other ports.

The steamship *City of Durham* arrived at Hongkong August 23, 1916, without cargo, from Shanghai, China, and proceeded at once alongside of a concrete rat-proof wharf. Immediately upon arrival the ship was fumigated with 4 per cent. sulphur dioxide. After the fumigation six dead rats were found. Examination of these rats showed that two of them were plague infected. The crew of 66 men were immediately examined and none found sick. The captain stated that no case of human plague had ever occurred aboard his ship.

This steamship is engaged in a general freight trade between New York, Boston, Philadelphia, and ports in the Far East, including Calcutta, Bombay, Rangoon, Vladivostok, Japan ports, Shanghai, Hongkong, and others. On her last voyage the ship left New York June 17, 1916, calling at Colon, Canal Zone; San Francisco, Muroran, Vladivostok, Shanghai and Hongkong in the order named. The master of the ship stated that while en route between Colon and San Francisco a member of the crew died of "internal trouble" June 29 and was buried at sea. On previous voyages the ship had been alongside the wharves at Calcutta and Rangoon, but whenever tied to a wharf standard rat guards had always been used on all lines. It was further stated that rats had very seldom been seen on the ship and the master had never heard of sick or dead rats being found on the vessel.—*U. S. Public Health Reports.*

SOME REMARKS ON ACTIVATED SLUDGE.

WILLIAM T. CARPENTER and MURRAY P. HOROWITZ,
Brooklyn Sewage Experimental Station.

Read before the Sanitary Engineering Section, American Public Health Association, Rochester, N. Y., September 9, 1915.

THE literature on the subject of activated sludge is so recent, and so well known to the sanitary engineers of the country, that it appears superfluous to follow the accepted custom, and preface the paper with a digest of the work of other investigators. Reference to points in the literature of the subject will, however, be made where desirable in the body of the present paper. The present writers hope to be able, in addition to presenting some engineering and laboratory data, to draw attention to some general principles which seem to underlie the process.

The Borough of Brooklyn has been coquetting with artificial aëration since 1910, though it must be admitted with candor that, previous to the work beginning in March of the present year, nothing had been developed that gave much promise of economical operation on a large scale. The experiments of Messrs. Black and Phelps were continued in 1914 on a larger scale, using a tank twenty feet high and twelve feet in diameter, holding 16,000 gallons, into the bottom of which compressed air was introduced by means of a grid of perforated iron pipe and which contained nine deflectors designed to impede the passage of air to the top. These deflectors are wooden grids or lattices so arranged that no bubble of air can pass directly to the top, but must take a zig-zag course.

At low retentions, five hours or so, no perceptible change in quality was apparent, using three to four volumes of air per volume of sewage. When the retention period was lengthened to twenty-four hours, and from fifteen to twenty volumes of air employed, a very fair quality of effluent was obtained, but at prohibitive cost.

In consequence of a visit to Lawrence, the writers fitted up an aërated contact bed, consisting of a fifty-gallon barrel filled with coarse broken stone and provided with means of aëration at the bottom. The results of this treatment, purely from the standpoint of purification effected, were simply wonderful. After five hours' aëration, the liquid drawn from the barrel was practically devoid of suspended matter and, to all intents and purposes, purified. After twenty hours, purification was complete (see Fig. 1). After a couple of months' operation, this unit was abandoned owing to its probably large air consumption and the fact that the stone occupied so large a portion of the tank that, to perform work equal to that of a sprinkling filter, the tanks would need to be very large and the economy would probably be low.

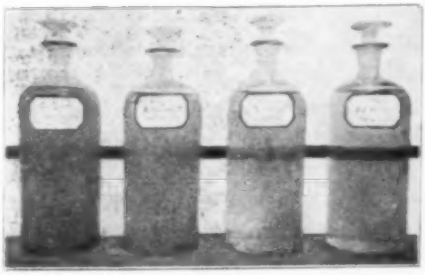

FIG. 1. Samples from "contact aërator" or stone-filled barrel. Note increasing clarity as shown by black band behind bottles.

In all this work, the function of the colloidal films with their myriads of contained bacteria was well recognized, but until the researches of Ardern and Lockett, it was supposed by the authors, in common with the rest of the profession, that the purifying growth must be attached to some medium such as slate or broken stone. Shortly after the publication of the English work, it was decided to make such minor alterations in the aërating tank as would permit the retention of the sludge precipitated by prolonged aëration. An outlet was introduced seven feet above the old one, allowing 6,000 gallons of sludge to remain in the bottom of the tank.

The accumulation of sludge was begun in March and proceeded principally by daily fillings, with an occasional run of several days to produce satisfactory activation. By June 1, the amount of sludge was sufficient to warrant regular cyclical operation, and the following cycle was adopted: 8 a. m., air shut off; sedimentation for one hour; 9 a. m., drawing off begun; 10.30 a. m., drawing completed, air turned on and filling begun; 12 M., filling completed.

This cycle has been adhered to throughout for two reasons, first, it was desired to have on hand a large supply of thoroughly activated sludge to start experiments in continuous operation, without being compelled to wait for the slow process of activation *in situ*, secondly, because the draft on the pumping plant during the filling of the aerating plant interfered seriously with the rates on the sprinkling filters and it seemed undesirable to have this interruption occur more frequently than once per day.

The following table shows the laboratory results obtained by averages for June, July and part of August.

		Crude Sewage.	Samples at various hours after re-fill			
			0 hrs.	2 hrs.	5 hrs.	20 hrs.
Susp. Sols.	June	180	35	24	20	14
	July	147	21	12	9	8
	August	154	24	12	8	6
Diss. Ox.	June	1.0	0.0	0.1	0.4	2.5
	July	.7	0.0	0.0	0.2	1.7
	August	.5	0.0	0.0	0.1	0.9
Rel. Stab.	June	...	14	31	76	100
	July	...	11	34	84	100
	August	...	12	28	63	88
Ox. Demand	June	230	53	38	...	7
	July	173	63	38	...	4
	August	211	53	34	...	11
Nitrous Nitrogen	June	...	.08	.11	.49	1.50
	July	...	.01	.07	.25	.53
	August	...	.00	.07	.12	.66
Nitric Nitrogen	June	...	.10	.60	1.20	7.30
	July	...	.00	.25	1.57	7.80
	August	...	.00	.10	.55	2.80

Air at 26 cu. ft. per minute.

The tests for suspended solids, nitrification and dissolved oxygen, were made on samples settled in the laboratory, and the tests for relation stability and oxygen demand were made on paper filtered samples, in order to distinguish the effects of the aeration process itself from those of the process of sedimentation which is, in a measure, a separate problem. The demand figures are thus a trifle lower, and the stability figures a bit higher than would otherwise be the case.

This table is particularly interesting for the sake of the conclusions which seem to be legitimate in regard to the basic theory of the activated sludge process.

The rapidity with which the organisms present reduce the demand for oxygen is noteworthy. During the process of refilling, the demand falls from about 200 p.p.m on the average, to about 60 p.p.m. Part of this drop is, of course, due to dilution with purified liquid from the previous run which remains with the sludge in the part of the tank below the draw-off pipe. Dilution, however, would reduce the demand only to ten sixteenths of its original value, or to 123 parts per million. This demand of sixty-three parts (123−60) is satisfied by the nitrite and nitrate oxygen, which is also reduced much more than the dilution would account for, in addition to the atmospheric oxygen dissolved from the air blown through the tank. This sixty-three parts is seen to be about seven complete saturations at summer temperatures. Bartow and Mohlman (*Jour. Eng. and Ind. Chem.*, April 1915) call attention to the effect of nitrite and nitrate oxygen from the previous cycle in aiding the stability of sewage in the early stages of treatment.

The rate of fall of demand constantly diminishes throughout the cycle, thus conforming to what seems to be a general law of all purification processes, namely, that the action proceeds most rapidly at the start. This would seem to indicate that a given amount of air would be most advantageously utilized by blowing it very rapidly at the beginning, and less so later.

A drop in efficiency is noticeable during August in all points under observation. This is very possibly due to accumulations of sludge in the bottom of the tank which are not lifted by the air and consequently interfere with nitrification. The presence of the deflectors makes direct observation of this point impossible without interruption of the experiment, but indirect evidence supports this theory. There are relatively large areas of the surface undisturbed by bubbling. The suspended matter during aëration is much less than should be there figuring from the suspended solids content of the applied sewage, and the analysis of the sludge seems to show little or no digestion, so the only place that it can be is in the bottom of the tank undisturbed by air.

The phenomena attending the sedimentation of well activated sludge are somewhat interesting. When the quantity is considerable (around 20 per cent. at complete subsidence),

the behavior in a settling cylinder is much the same as that of the precipitate resulting from the addition of manganous sulphate and alkaline iodide to water in the determination of dissolved oxygen. The material subsides as if it were a mass of loose cotton undergoing compression, with a sharp line of demarkation between the suspensa and the supernatant, and not like an aggregation of free falling particles with widely varying rates of subsidence, giving rise to a shading off into clear supernatant. The initial rate of settling in a test recently made, was a trifle over an inch per minute, which rate rapidly diminished as the process of compacting went forward (see Fig. 2).

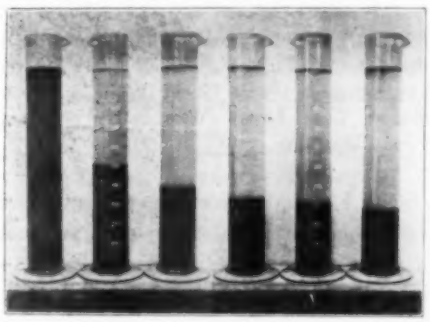

FIG. 2. Illustrating settlement of activated sludge in cylinders at five minute intervals, 0 mins. to 25 mins. inclusive.

Experiments on continuous operation began on July 14. A wooden tank four and a half feet in diameter and eight feet deep having a conical bottom, and holding about nine hundred gallons, was equipped with means for introducing crude sewage near the bottom, and with five carborundum air diffusers furnished through the courtesy of the Wallace and Tiernan Company who also loaned an air meter (see Fig. 3). The sedimentation

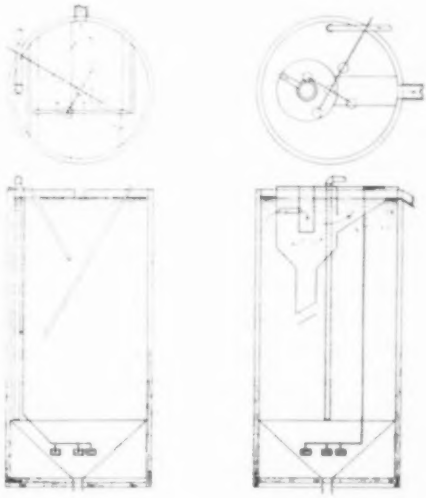

FIG. 3. Plan and section of continuous aërating tank showing both types of sediment compartment.

chamber consisted of a trough built into the top like the settling compartment of an Imhoff tank, the sewage entering at one end of the trough, flowing through it and out at the other end, the sludge settling *en route*, and sliding through the slot into the aëration chamber beneath (see Fig. 3 A). The settling compartment had a capacity of 100 gallons. Air was applied at the rate of .7 cubic feet per minute, and the sewage flowed at the rate of 95 gallons per hour, giving a retention of about eight and one half hours in the aëration chamber, and a trifle over an hour in the sedimentation chamber. This con-

tinuous tank was initially charged with activated sludge from the large fill and draw tank. This operation resulted in a very well clarified effluent most of the time, and the oxygen demand was but 27 p.p.m. on the average, though the relative stability was also low, being but 33 per cent. The principal difficulty encountered with this arrangement was that the commotion in the aëration chamber was frequently communicated to the settling compartment through the slot, giving rise to whirls, which sent the settling material back to the surface, and occasionally over the outlet. This, of course, would probably be much less serious in a larger tank, as the velocity of the whirl would be dissipated before traveling the longer distance to the surface.

To obviate this difficulty, a galvanized iron settling tank was designed and installed with the idea of making the disturbances travel a longer path before reaching the surface (see Fig. 3 B). This consists of a cylinder two feet in diameter and eighteen inches long, a conical bottom whose frustum is twelve inches in depth and a length of galvanized stove pipe about three feet long protected from the direct bubbling of air by means of an inclined baffle. A slight additional period of settlement is provided by a kind of lip, or chute, triangular in longitudinal section, extending from the outer cylinder to the outlet. Sewage enters through a small central cylinder within the larger one, and must travel a devious path before it can leave the tank. The capacity of this sediment chamber is about sixty-nine gallons, or 7.7 per cent. of the entire capacity of the system.

Operation of the continuous aërator with this new method of sedimentation began on August 12, using a retention period of eight and three quarters hours of aëration and three quarters hours sedimentation. The results for the first week were most gratifying (see Fig. 4). The effluent was highly

Fig. 4. Samples from continuous activated sludge tank. Bottles from left to right are Crude Sewage, Tank Liquid With Unsettled Sludge, Tank Liquid With Settled Sludge, Final Effluent.

clarified, its demand for oxygen was low, though the absence of dissolved oxygen and nitrates rendered the stability low. Then sedimentation began to be notably imperfect, though the quality of the paper-filtered effluent continued good. The tank was emptied and refilled with a fresh charge of thoroughly activated sludge from the big tank, and the retention reduced to four and one half hours in air and twenty-three minutes sedimentation. This produced a fair removal of floc at first, but the amount soon became large again. This seems to indicate that while a short period of retention will suffice to settle sludge which has been

aërated for 20 hours without any addition of fresh sewage, a longer period is necessary when the operation is going continuously a much shorter aëration period.

The air cost, per million gallons, using Mr. Hatton's assumptions blower and motor efficiency, 73 per cent. and 90 per cent. respectively, and figured current at one cent per K.W.H. is $1.45 for the nine and one half-hour period, and $0.69 for the four and one half-hour period. The lowest quotation for current obtainable in New York for this purpose, is two cents per K.W.H.

In closing this paper it is well to call attention to the matter of short-circuiting, or the passage of portions of the sewage through an aëration tank without remaining the entire intended period. Previous writers have mentioned this, and the present authors undertook a mathematical analysis of the course of events when a portion of sewage small enough to be considered as entering instantly is instantly mixed throughout the tank, the flow continuing constant throughout. This study shows that under the above assumptions but 37 per cent. of the original portion remained to get the full intended aëration. Short-circuiting is a very real fact even in tanks carefully designed to prevent it, as the authors found in the course of experiments with dye on small model tanks, and with the violent churning of the air considered, the mathematical assumption of instantaneous mixture is not so far different from the physical event as many others are. Short-circuiting can be minimized by dividing the retention among several smaller tanks in series, or by using one tank with a length great in proportion to its breadth and height.

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HOLES IN THE HARRISON LAW.

In June, Justice Holmes of the United States Supreme Court handed down a decision in the Jin Fuey Moy case which interpreted the Harrison Narcotic Act as a revenue measure, controlling dealers and physicians, but in no way holding the mere possessor or user of narcotics liable to the law. This resulted in making it impossible for United States attorneys to continue prosecutions, as formerly under the Act, against mere possessors of the drug. The Texas Statute is far superior and in many instances county attorneys must take up the work of fighting the narcotic evil, in place of the United States attorneys, if results are to be accomplished.

Now comes Federal District Judge Bourquin, in Montana, with a decision, which, if it stands, will exempt the prescribing physician from one of the restrictions placed upon him by the official interpretation of the statute. He decided, in effect, that there is no restriction in the law against the prescribing of any quantity of a narcotic. He says:

"In said law is nothing prescribing quantities or forbidding orders or prescriptions for the drug in any quantity. Any attempt to find it therein by construction or implication does violence to that elementary principle, that when Legislatures undertake to create offense it must be in language clear and definite, making it obvious to ordinary intelligence that by a certain conduct a crime and the offense denounced by the statute is committed. Hence such construction or implication is never permitted."

It has all along been evident that the law has been so soldered over by departmental rulings as to make a clear view of the statute impossible. The courts are slowly melting this away, until the Act now seems so leaky that unless Congress soon does some recasting it will hold nothing.—*Texas State Journal of Medicine.*

SOME RESULTS OF THE TREATMENT OF THE BALTIMORE DRINKING WATER BY CALCIUM HYPOCHLORITE.*

WILLIAM ROYAL STOKES, M. D., and FRANK W. HACHTEL, M. D.,
Baltimore, Md.

Read before the Laboratory Section of the American Public Health Association, Forty-third Annual Meeting, Rochester, N. Y., September 7–10, 1915.

IN THE following report we shall present the results obtained by the treatment of the Baltimore drinking water during 1911, 1912, 1913 and 1914, by calcium hypochlorite. This will include the reduction of the water and intestinal bacteria and also the decrease in the typhoid morbidity and fatality.

DESCRIPTION OF WATER SUPPLY.

The city of Baltimore is furnished with water from two distinct supplies, namely: the Gunpowder River and the Jones Falls. Both of these streams run through a densely populated rural district in which there are not a few small towns and villages. The water from each source is collected in an impounding reservoir, that of the Gunpowder River being known as Loch Raven, and that of the Jones Falls being known as Lake Roland. The water from Loch Raven then flows through a tunnel 36,500 feet long into the first storage reservoir known as Lake Montebello and thence into three other storage reservoirs, which then distribute the water through the city mains. It probably takes from five to ten days for the water to flow from the impounding reservoir to the city taps.

The water from the Lake Roland impounding reservoir flows through a tunnel 19,000 feet long into a storage reservoir known as Lake Hampden. This is then mixed with water from the Gunpowder Service in a second storage reservoir known as Druid Lake, and from this point it is distributed through the city mains. A certain portion of the city, therefore, is furnished with Gunpowder water and the other portion with a mixture of Gunpowder and Jones Falls water. The unmixed Gunpowder water furnishes 69.2 per cent. of the total amount supplied to the citizens and 30.8 per cent. consists of a mixture of the two supplies. About two thirds of this mixture consist of Jones Falls water and one third Gunpowder water.

AMOUNTS OF CHEMICALS USED.

The treatment of the drinking water with calcium hypochlorite was begun in connection with the Lake Roland supply on June 7, 1911, and the treatment of the Loch Raven supply was commenced on June 22. In the beginning both supplies were treated with .6 part of available chlorine per million parts of water. About the last of June this was increased to 0.75 and in the middle of October it was again increased to 1.0 part per million. No

* From the Bacteriological Laboratory of the State and City Departments of Health, Baltimore, Md.

aluminum sulphate was used during this year.

During 1912, 1.0 part of available chlorine was added to both supplies until April 15, and this practice was usually continued until July 1, but whenever the turbidity rose above 50 the available chlorine was increased to 1.5 parts per million of water. From July 1 until the end of the year the available chlorine equaled 1.5 parts per million parts of water.

Owing to the turbidity of the water it was determined at the beginning of 1913 to add aluminum sulphate in addition to using calcium hypochlorite. The aluminum sulphate was added to the first storage reservoir of the Gunpowder system in order to clarify the water and make the addition of the hypochlorite more effective, and the hypochlorite was added to the effluent of this reservoir after the turbidity had become greatly reduced. In the Lake Roland supply it was necessary to add the aluminum sulphate after the hypochlorite, as there was no way of making a preliminary addition of this material. The amount of aluminum sulphate added varied according to the turbidity, the minimum being .140 grs. per gallon and the maximum 2.532.

With the exception of a few days in January, the amount of available chlorine used on the Gunpowder supply was 0.8 of a part per million which lasted until June, and from then until the middle of September from 1 to 1.5 parts were used. From then until the last of October 2.0 parts were used, and during November this was reduced to 1.75, and during December the available chlorine was further reduced to 1.5 parts per million parts of water.

The Jones Falls water was treated with 1.5 parts per million from the first of the year until June, but during most of this month 1.25 parts were used. During July until the middle of August 1.5 parts were used, and from then until the end of the year 2.0 parts were used with the exception of the first week to the end of November when 1.75 parts were put into the water.

No aluminum sulphate was added to the Lake Roland water during 1914, but a minimum of .615 and a maximum of 2.065 were added to the Gunpowder supply. The table which follows will show the amount of available chlorine added during the various portions of the year, and this has varied between a minimum of 1.0 and a maximum of 3 parts per million parts of water. The amount during the greater portion of the year, however, has varied between 1.5 and 2.0 parts per million, and larger amounts have only been added occasionally. During the first half of the year 2.0 parts were used for the Lake Roland supply and during the latter half 2.5 parts were used.

Bacterial Reduction Effected by the Treatment of the Water.

During 1911 the average monthly general bacterial reduction in the water from the Loch Raven impounding reservoir, as determined by examination of samples from the city taps, varied between 93.7 per cent. and 99.5 per cent., but the percentage of positive tests for the presence of the colon

TABLE 1.

RECORD OF AVAILABLE CHLORINE IN PARTS PER MILLION USED IN TREATING THE CITY WATER DURING 1914

LOCH RAVEN SUPPLY.

1914.	Parts per million.
Jan. 1	1.50
May 17	1.75
May 18	2.00
May 22	1.50
May 23	2.00
May 25	1.50
June 21	2.00
June 25	1.50
July 2	2.00
July 8	2.50
July 9	2.50
July 11	2.00
July 13	1.50
July 27	2.00
July 28	2.50
July 31	2.00
Aug. 1	2.50
Aug. 3	1.50
Aug. 5	1.75
Aug. 6	2.00
Sept. 2	2.50
Sept. 3	3.00
Sept. 7	2.66
Sept. 9	2.00
Sept. 11	1.75
Sept. 12	1.50
Sept. 18	1.00
Sept. 19	1.66
Sept. 20	2.00
Sept. 21	1.50
Sept. 22	2.20
Sept. 23	2.50
Sept. 26	1.50
Sept. 28	2.00
Sept. 30	1.50
Oct. 30	2.50
Oct. 31	1.50
Nov. 2	2.00
Nov. 4	1.50
Nov. 8	2.45
Nov. 12	1.50
Dec. 9–31	2.00

LAKE ROLAND SUPPLY.

Jan. 1	2.00
June 27	2.25
June 28–December 31	2.50

Each date indicates the day upon which the given amount of available chlorine was used and this same amount continued daily until the next date given. It should be understood, therefore that calcium hypochlorite was used daily during the entire year.

bacillus varied between 0 and 12 per cent. in .1 cubic centimeter of water and 12 and 38 per cent. in 1 cubic centimeter of water.

The results from the Lake Roland water were about the same, the average monthly general bacterial reduction varying between 91.1 per cent. and 99.5 per cent. The percentage of positive tests for the colon bacillus varied between 0 and 13 per cent. in .1 of a cubic centimeter and between 10 per cent. and 40 per cent. in 1 cubic centimeter of water.

The yearly average bacterial reduction in the Loch Raven system was 97.5 per cent. and the average of positive tests for the colon bacillus in .1 cubic centimeter was 5.5 and in 1 cubic centimeter it was 30.3 per cent.

The yearly average bacterial reduction in the Lake Roland system was 96.2 per cent. The average of positive tests for the colon bacillus in .1 of a cubic centimeter was 5.1 per cent. and in 1 cubic centimeter it was 26.9 per cent.

During 1912 the minimum average monthly general bacterial reduction in the tap water from the Loch Raven system was 16 per cent. and the maximum reduction was 99.5 per cent.

The city taps were tested in quantities of 1 and 10 cubic centimeters, and the minimum percentage of positive colon tests in 1 cubic centimeter was 5, while the maximum percentage was 72. The minimum percentage in 10 cubic centimeters was 29 and the maximum was 100.

In the water from the Lake Roland system the minimum percentage of monthly bacterial reduction was 44.4

and the maximum was 98.6. The minimum percentage of positive colon bacillus tests in 1 cubic centimeter was 8 and the maximum was 67.

The average yearly bacterial reduction in the tap water from the Loch Raven system was 78.1 per cent. The average yearly percentage of positive colon tests in 1 cubic centimeter was 21.5 and in 10 cubic centimeters it was 55.2.

In the city tap water from the Lake Roland system the average yearly bacterial reduction was 84.0 per cent. The percentage of positive colon tests in 1 cubic centimeter was 34.3 and in 10 cubic centimeters it was 62.9.

During 1913 the minimum average monthly general bacterial reduction in the tap water from the Loch Raven system was 26 per cent. and the maximum bacterial reduction was 99.9 per cent. The minimum percentage of positive colon bacillus tests in 1 cubic centimeter was 0 and the maximum was 29. The minimum percentage in 10 cubic centimeters was 0 and the maximum was 65.

In the water from the Lake Roland system the minimum percentage of average monthly general bacterial reduction was 7.4 and the maximum bacterial reduction was 99.3. The minimum percentage of positive colon bacillus tests in 1 cubic centimeter was 0 and the maximum was 25.

The average yearly bacterial reduction in the tap water from the Loch Raven system was 84.5 per cent. The average yearly percentage of positive colon tests in 1 cubic centimeter was 10 and in 10 cubic centimeters the percentage was 29.8.

In the tap water from the Lake Roland system the average yearly bacterial reduction was 68.9 per cent. The percentage of positive colon bacillus tests in 1 cubic centimeter was 7.8 and in 10 cubic centimeters it was 31.9.

During 1914 the minimum average monthly general bacterial reduction in the tap water from the Loch Raven system was 32.7 per cent. and the maximum was 99.9 per cent. The minimum percentage of positive colon tests in 1 cubic centimeter was 0 and the maximum was 7, while in 10 cubic centimeters the minimum was 0 and the maximum 22.

In the tap water from the Lake Roland system the minimum percentage of average bacterial monthly reduction was 18 and the minimum was 99.9. The minimum percentage of positive colon tests in 1 cubic centimeter was 0 and the maximum was 3, while in 10 cubic centimeters the minimum was 0 and the maximum was 26.

The yearly average bacterial reduction in the tap water from the Loch Raven system was 92.6 per cent. The yearly average percentage of positive colon tests in 1 cubic centimeter was 1.8 and in 10 cubic centimeters was 11.1.

In the city tap water from the Lake Roland system the yearly average bacterial reduction was 83.8 per cent. The average percentage of positive colon tests in 1 cubic centimeter was .66 and in 10 cubic centimeters was 8.

In 1914 larger amounts of hypochlorite were used than in former years, and the effect upon the Loch Raven system was satisfactory. The

general average monthly bacterial reduction usually ranged from 98 to 99 per cent., and in 1 cubic centimeter of water the percentage of positive colon tests was very small. In 10 cubic centimeters it has been variable, but never above 20 per cent. The following table shows the results of the bacteriological examinations for this year as expressed in monthly averages. This table is published in detail in order to show what may be accomplished in purifying a polluted water supply when hypochlorite is used alone, or is preceded by sedimentation with aluminum sulphate.

As previously stated, aluminum sulphate was used on the Loch Raven supply in order to decrease the turbidity before treatment with calcium hypochlorite, but only hypochlorite was used for the Lake Roland supply.

The tables for 1914 follow, and the term "Raw water" indicates the untreated supply, "Storage," the treated water in the storage reservoirs, and "City taps," the water as delivered to the citizens.

Relation Between Available Chlorine Used for Treatment and Residual Chlorine in the City Tap Water.

The relation of the amount of available chlorine used in treating the drinking water to the amount of residual chlorine found after treatment is an important subject, as it is not desirable to have too much residual chlorine left in the water. The results in Table 4 which are given below were obtained with water usually showing a low turbidity, since this water had previously been treated with aluminum sulphate. The range of turbidity has been given for the ten days preceding the time that the tests for residual chlorine were made from the city taps. This range of turbidity was used since our experience has shown that the treated water might take anywhere from one to ten days to arrive at the city taps, although the usual time is much less than ten days. The range of turbidity is stated in the table and the amount of available chlorine which was being used during the ten days previous to the test for available chlorine is also stated in the table. The turbidity is expressed according to the scale adopted for the silica standard described in Standard Methods for the Examination of Water and Sewage.

This table shows that when 1.5 parts of available chlorine per million parts of water were used there is practically no residual chlorine in the water. In one case when 1.75 parts were used there was a large amount of residual chlorine, giving an average from the twenty-four wards of .574. On another occasion, however, when this amount was used the residual chlorine was less, giving an average of 0.24 per million parts of water. When 2.0 parts of available chlorine were used there was an average from the twenty-four wards of 0.206, and when 2.5 parts of available chlorine were used for treatment there was an average of 0.62 parts per million parts of water. These results, therefore, are somewhat variable, and it is hard to explain the greater amount of residual chlorine when 1.75 parts were used

TABLE 2.

LOCH RAVEN SYSTEM, 1914.

Months, water.		No. examinations.	Average bacteria per cc.	Percentage of bacterial reduction.	Percentage of positive colon tests.			
					0.01 cc.	0.1 cc.	1 cc.	10 cc.
January	Raw water	15	14,000	....	16	66	88	100
	Storage	26	2	99.9	0	0	0	0
	City taps	48	27	99.8	..	..	2	2
February	Raw water	18	7,000	....	21	68	84	100
	Storage	21	21	99.7	0	0	0	0
	City taps	15	80	98.9	..	..	0	20
March	Raw water	13	20,000	....	16	25	83	100
	Storage	24	29	99.8	0	0	0	0
	City taps	25	225	98.9	..	..	0	3
April	Raw water	9	5,500	....	14	14	28	57
	Storage	20	110	98.0	0	0	0	0
	City taps	45	3,700	32.7	..	..	0	2
May	Raw water	11	80,000	....	15	31	69	85
	Storage	24	1,600	98.0	0	0	4	31
	City taps	51	12,000	85.0	..	..	4	9
June	Raw water	14	12,000	....	20	53	80	100
	Storage	24	2,000	83.3	0	0	4	15
	City taps	42	55	99.6	..	..	3	17
July	Raw water	13	8,100	....	28	71	88	100
	Storage	13	210	97.4	0	0	12	38
	City taps	27	12	99.9	..	..	7	22
August	Raw water	24	19,500	....	29	71	87	100
	Storage	27	1,800	90.8	0	0	11	29
	City taps	30	75	99.6	..	..	3	13
September	Raw water	15	4,500	....	5	44	78	100
	Storage	15	500	88.9	0	0	13	39
	City taps	23	70	98.5	..	..	0	17
October	Raw water	23	7,900	....	17	79	100	100
	Storage	22	1,000	87.3	0	0	8	35
	City taps	33	50	99.4	..	..	3	15
November	Raw water	14	175,000	....	13	27	60	93
	Storage	13	400	99.8	0	0	4	9
	City taps	30	60	99.9	..	..	0	14
December	Raw water	13	350,000	....	33	67	78	100
	Storage	18	275	99.9	0	0	0	11
	City taps	12	2,000	99.4	..	..	0	0

TABLE 3.

LAKE ROLAND SYSTEM, 1914.

Months, water.		No. examinations.	Average bacteria per cc.	Percentage of bacterial reduction.	Percentage of positive colon tests.			
					0.01 cc.	0.1 cc.	1 cc.	10 cc.
January	Raw water	25	90,000	....	12	64	100	100
	Storage	25	1,400	98.5	0	0	0	12
	City taps	47	50	99.9	..	..	0	0
February	Raw water	21	25,000	....	0	13	56	91
	Storage	20	3,900	84.4	0	0	4	30
	City taps	15	85	99.7	..	..	0	13
March	Raw water	22	4,400	....	0	4	35	81
	Storage	22	3,600	18.2	0	0	0	4
	City taps	36	1,000	77.3	..	..	0	0
April	Raw water	19	5,500	....	0	0	14	76
	Storage	22	2,100	61.8	0	0	0	9
	City taps	45	4,500	18.2	..	..	0	2
May	Raw water	17	21,000	....	6	23	53	88
	Storage	25	11,000	47.6	0	0	4	24
	City taps	51	12,500	40.5	..	..	2	11
June	Raw water	25	14,000	....	0	16	40	68
	Storage	25	1,200	91.4	0	0	24	36
	City taps	42	70	99.5	..	..	3	14
July	Raw water	20	20,000	....	20	48	84	100
	Storage	22	650	96.8	0	0	27	50
	City taps	26	50	99.8	..	..	0	26
August	Raw water	13	99,000	....	25	75	95	100
	Storage	14	1,100	98.9	0	5	40	65
	City taps	28	950	99.1	..	..	0	11
September	Raw water	19	25,500	....	20	60	90	100
	Storage	20	2,800	89.0	0	24	48	67
	City taps	24	125	99.5	..	..	0	0
October	Raw water	24	4,200	....	24	48	68	100
	Storage	25	650	84.5	15	59	74	96
	City taps	32	50	98.8	..	..	3	6
November	Raw water	20	16,000	....	4	40	67	92
	Storage	17	1,700	89.4	0	33	37	62
	City taps	30	65	99.6	..	..	0	13
December	Raw water	23	29,000	....	9	56	96	100
	Storage	24	3,800	86.9	0	0	0	56
	City taps	12	7,800	73.1	..	..	0	0

TABLE 4.

RESIDUAL CHLORINE IN CITY WATER, EXPRESSED IN PARTS PER MILLION.

Wards.	Oct. 16, 1913.	Nov. 20, 1913.	Jan. 15, 1914.	Jan. 24, 1915.	Feb. 15, 1915.
First	.282	.560	.03	0.8	0.36
Second	None	.400	.02	0.4	0.32
Third	.432	.700	.03	0.7	0.36
Fourth	.372	.700	.03	1.0	0.40
Fifth	.252	.480	.03	0.8	0.35
Sixth	.282	.320	.03	0.6	0.06
Seventh	.192	.560	.02	0.6	0.22
Eighth	.132	.616	.03	0.9	0.70
Ninth	.192	.584	.03	0.8	0.40
Tenth	.132	.560	.02	0.6	0.26
Eleventh	.192	.560	.03	0.6	0.28
Twelfth	.192	.400	.03	0.6	0.04
Thirteenth	.192	.400	.02	0.6	0.22
Fourteenth	.252	.480	.03	0.9	0.22
Fifteenth	.192	.480	.03	0.8	0.26
Sixteenth	.192	.640	.03	0.8	0.36
Seventeenth	.192	.720	.04	0.5	0.22
Eighteenth	.072	.640	.04	0.6	0.00
Nineteenth	.180	.480	.02	0.4	0.16
Twentieth	.192	.720	.04	0.4	0.10
Twenty-first	.072	.700	.03	0.4	0.22
Twenty-second	.192	.560	.03	0.5	0.00
Twenty-third	.432	.760	.03	0.6	0.30
Twenty-fourth	.132	.760	.03	0.0	0.06
Average content for 24 wards	.206	.574	.029	0.62	0.24
Available chlorine used for treatment of water in parts per million	2.0	1.75	1.50	2.5	1.75
Turbidity of treated water	From 5 to 13	From 5 to 12	From 5 to 14	From 15 to 50	From 4 to 11

than when 2.0 parts were used. The amount of residual chlorine, however, may be influenced by other things besides turbidity, as temperature and unknown conditions may influence the absorption of the chlorine.

This table, however, has been instructive to us since we have come to the conclusion that less than 2.0 parts of available chlorine per million parts of water cannot always be relied upon to thoroughly disinfect the water and prevent the water-borne typhoid. It would seem, therefore, that a small amount of residual chlorine in the water after treatment is really necessary in order to insure proper disinfection of the water.

It is also appreciated that the table of residual chlorine does not express results which might be obtained if a water with a greater turbidity were being treated. By the use of aluminum sulphate, however, in the treatment of the Baltimore drinking water we were able to keep the turbidity below 30 with very few exceptions, so that when preliminary sedimentation

with aluminum sulphate is being used and the turbidity is kept below 30 the table may act as somewhat of a guide for indicating the amount of resid al chlorine which may be left when varying amounts of available chlorine are being used for treating the water.

Reduction in the Typhoid Morbidity and Fatality.

In 1911 the treatment of the water by calcium hypochlorite was begun and the number of cases reported during that year was 1,201 and the number of deaths 154. In 1912 the cases were reduced to 1,083 and the deaths to 136. In 1913 there was a slight increase of reported cases, these numbering 1,163, but the deaths were again 136, and in 1914 the reported cases dropped to 757 and the deaths to 130.

The decrease in typhoid fever caused by the hypochlorite treatment of the water can be seen by consulting chart No. 1 which gives the typhoid death-rate per 100,000 of population from 1890 to 1914 inclusive. The maximum rate before the use of calcium hypochlorite was in 1890 and was 54.4, and the minimum was in 1909, being 24.7. The average from 1890 to 1910 inclusive, being the period during which hypochlorite was not used, was 38.9. The maximum from 1911 to 1914 inclusive was 27.4 and the minimum was 22.2, the average being 24.3. This is a decided reduction when compared to 38.9 during the former period during which the water was not treated.

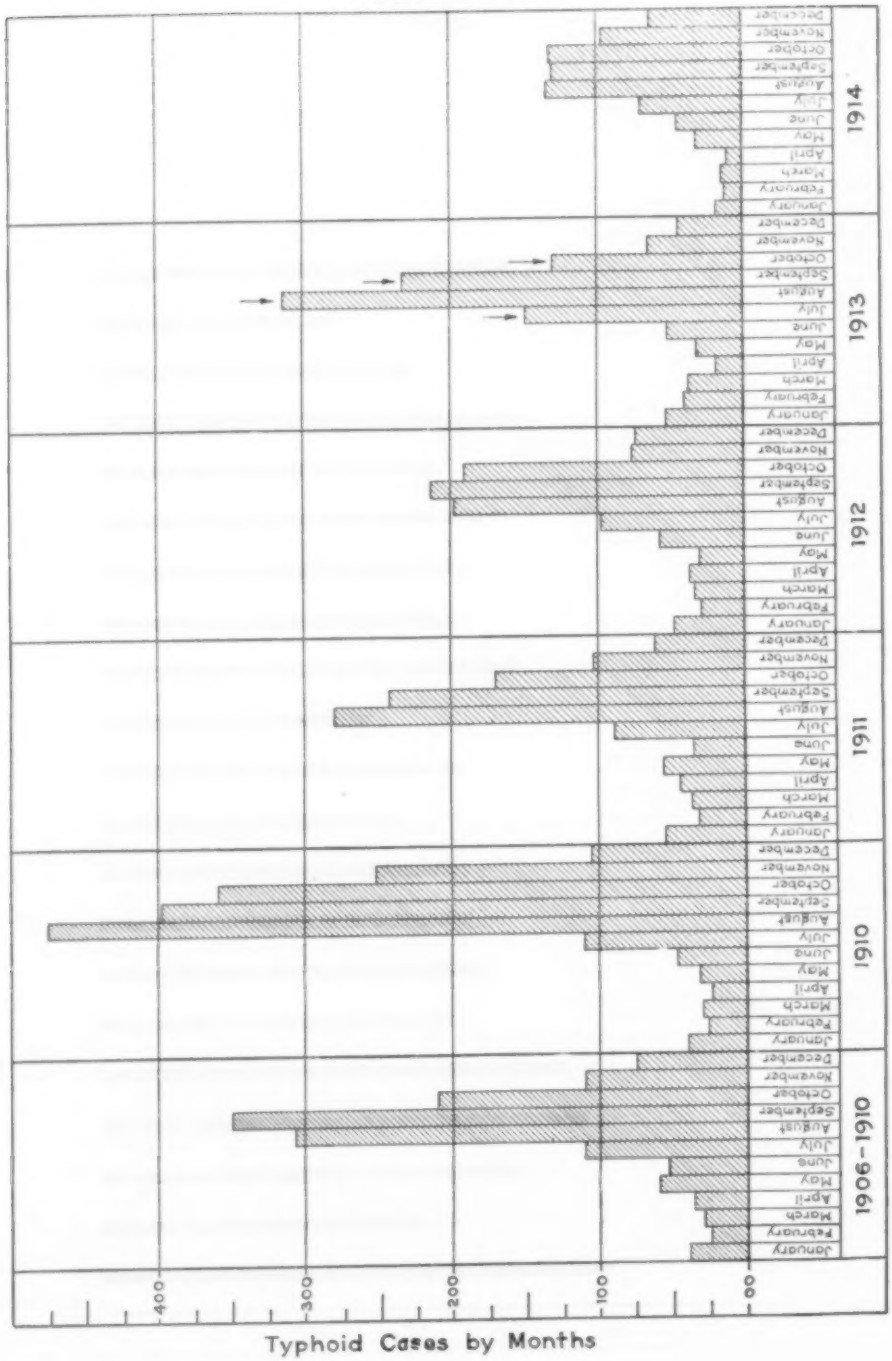
The special effect of a reduction in the amount of calcium hypochlorite can be seen in chart No. 2 which shows the typhoid cases by months from 1910 to 1914 inclusive, and the average of cases from 1906 to 1910 before the hypochlorite was used. In July, August, September and October, 1913, the rise in the number of reported cases of typhoid fever can be seen, as indicated by the arrows. During 1913 from June until the middle of August only 1.0 part of available chlorine was used in treating the Gunpowder supply which furnishes most of the water for the city. This was increased on the 18th of August to 1.5 parts, but even this increase did not seem sufficient to effect a drop in the number of cases reported. In the middle of September 2.0 parts of available chlorine were used and there was a decided drop beginning about the middle of October and becoming much more marked during November and December of this year.

It should also be noted in considering the drop in the number of reported cases and deaths from typhoid fever since the treatment of the water by calcium hypochlorite that a number of cesspits have been gradually abandoned in Baltimore during these years, owing to the installation of a new sewerage system. In the earlier years of the treatment, however, a very small percentage of these cesspits had been abandoned and the immediate drop in the typhoid death-rate and reported cases would indicate that the treatment by calcium hypochlorite has had a marked effect in reducing the typhoid fever in Baltimore.

CHART No. 1

TYPHOID DEATH-RATE PER 100,000 POPULATION

CHART Nº II


1906–1910
1910
1911
1912
1913
1914
January
February
March
April
May
June
July
August
September
October
November
December
400
300
200
100
00
Typhoid Cases by Months

Conclusions.

The best temporary method for the treatment of the Baltimore drinking water until the filtration plant is completed is the preliminary use of aluminum sulphate in the storage reservoirs followed by the treatment of the clear water by calcium hypochlorite. During the winter months from 1.5 to 1.75 parts of available chlorine per million parts of water should be used and during the summer months 2.0 parts should be used when the turbidity is below 30. When this rises above 30, which is only occasionally, 2.0 parts should be used in the winter and 2.5 parts in summer.

This treatment has effected a reduction in the reported cases and deaths from typhoid fever in Baltimore, but the method has only been used as a temporary expedient until the filtration plant can be completed. The use of calcium hypochlorite in these amounts will produce a reduction of about 99 per cent. in the number of water bacteria present, and positive colon tests in 1 cc. of water can almost be eliminated. In 10 cc. of water, however, a fair percentage of positive tests will still be noted.

In conclusion we wish to thank Mr. Ezra B. Whitman and Mr. Robert L. Clemmitt, the Water Engineers who directed the treatment of the drinking water, Mr. J. Bosley Thomas, Director of the Laboratory of the Water Department, from whom we have obtained much valuable data, and Dr. Frederick C. Blank, Chief and Chemist to the Bureau of Food and Dairy Inspection of the Baltimore Health Department for the chemical analyses.

METAL-MINE ACCIDENTS IN THE UNITED STATES DURING THE CALENDAR YEAR 1915.

Compiled by Albert H. Fay, Bureau of Mines.

There was a slight decrease in the number of men killed in the metal mines of the United States in 1915 as compared with 1914, the total number killed as reported to the Bureau of Mines, Department of the Interior, by the operators being 553 in 1915 as compared with 559 in 1914, 683 in 1913, 661 in 1912, and 695 in 1911. The number of men reported employed, however, during 1915 was slightly less than the previous year, the numbers being 152,118 in 1915 as compared with 158,115 in 1914. The fatality rate, therefore, for 1915 was slightly higher than for the preceding year, being 3.64 per 1,000 men employed in 1915 as against 3.54 per 1,000 for 1914; 3.57 in 1913; 3.91 in 1912; and 4.19 for 1911.

There were reported 35,295 non-fatal injuries for 1915, of which thirty-five were permanent total disability; 574 permanent partial disability; 7,242 other injuries of a temporary nature involving a loss of more than fourteen days, and 27,144 minor injuries wherein the time lost was one to fourteen days. The non-fatal injury rate per 1,000 men employed was 232 as compared with 191 for 1914. This increase is not necessarily significant of an increased hazard, but the real dangers are more nearly set forth by reason of better records at the mines and more complete reports to the bureau.

REPORT OF SPECIAL COMMITTEE ON INFANTILE PARALYSIS.

ON the first day of the recent Cincinnati meetings of the American Public Health Association, the following preamble and resolution was presented by Dr. E. P. Lachapelle of Montreal and seconded by Dr. Frederick Montizambert of Ottawa.

In view of the fact that Infantile Paralysis has existed for several months and still exists in the United States and Canada, taking on in some localities an epidemic character; that considerable anxiety is expressed by the public generally, and that they, the public, the physicians and the health authorities may well expect an authoritative statement upon the subject from this Association in Annual Convention assembled.

Be it Resolved: That the President be forthwith authorized to appoint a small committee of specialists and of those who have had experience of the disease with instructions to meet immediately and to prepare a report of the present actual knowledge of the cause of the disease, the manner and agents by which it is spread, the best methods of treatment, and the best preventive measures.

And that this committee submit its report before the close of this Annual Meeting; and that such report be given to the public immediately.

The resolution committee of the Association unanimously approved of the above resolution and in accordance with it the President, Dr. John F. Anderson, appointed the following special committee: Dr. Haven Emerson, Commissioner of Health, New York City; Dr. Wade Frost, United States Public Health Service, Cincinnati, O.; Dr. A. J. Chesley, Epidemiologist, Minnesota State Board of Health, Minneapolis, Minn. The report of this committee is appended herewith. The Association at its meeting on Friday afternoon, October 27, unanimously approved and adopted the report.

The Committee of the American Public Health Association, appointed by the President to report upon the subject of poliomyelitis, begs to submit the following:

The specific cause of poliomyelitis is a microörganism, a so-called virus, which may be positively identified at present only by its production of poliomyelitis in monkeys experimentally inoculated. Such experiments have shown this virus to be present not only in the nervous tissues and certain other organs of persons who have died of poliomyelitis, but also in the nose, mouth and bowel discharges of patients suffering from the disease. It has been proved by similar experiments that healthy associates of poliomyelitis cases may harbor the virus in their noses and throats.

These experiments, together with the fact that monkeys have been infected by direct application of the virus to the mucous membrane of the nose and by feeding of the virus, are strong evidence that in nature infection may be directly spread from person to person.

Observations on the occurrence of the disease might seem at first thought to be inconsistent with this conception, since contact between recognized cases can seldom be traced. However, this may be adequately explained by the lack of means for detecting mild non-paralytic cases, and by the belief that healthy carriers of the virus and undetected cases are considerably more numerous than frankly paralyzed cases.

Many facts, such as the seasonal incidence and rural prevalence of the disease, have seemed to indicate that some insect or animal host, as yet unrecognized, may be a necessary factor in the spread of poliomyelitis, but specific evidence to this effect is lacking, and the weight of present opinion inclines to the view that poliomyelitis is exclusively a human disease, and is spread by personal contact, whatever other causes may be found to contribute to its spread. In personal contact we mean to include all the usual opportunities, direct or indirect, immediate or intermediate, for the transferrence of body discharges from person to person, having in mind as a possibility that the infection may occur through contaminated food.

The incubation period has not been definitely established in human beings. The information at hand indicates that it is less than two weeks, and probably in the great majority of cases, between three and eight days.

If the foregoing conception of the disease is correct, it is obvious that effective preventive measures, approaching complete control, are impracticable, because isolation of recognized cases of the disease and restraint upon their immediate associates must fail to prevent the spread of infection by unrecognized cases and carriers.

These difficulties would appear to be inherent in the nature of the disease. Nevertheless, we may hope for the development of more thorough knowledge which will permit of more effective control of the disease than is now practicable. Of first importance is the more general recognition by practitioners of non-paralytic cases through clinical observation and laboratory procedures.

Lumbar puncture has been shown to offer valuable aid in diagnosis, and a more general use of this test is to be encouraged, since it not only facilitates accurate and early diagnosis, but in many cases affords symptomatic relief as a therapeutic procedure. Without undertaking to predict the future progress of research, we may hope for certain possible developments which may afford far more effective control of the disease, with substantial relief from many inconveniences at present inevitable. Among these possibilities we would include: a practical test for the detection of all clinical types and carriers; a simple and reliable test for distinguishing between susceptible and insusceptible persons; and means of conferring artificial immunity against poliomyelitis.

At present our information demands the employment of the following administrative procedures in attempting to control the disease:

1. The requirement that all recognized and suspected cases be promptly reported.

2. Isolation of patients in screened premises. The duration of infectivity being unknown, the period of isolation must necessarily be arbitrary. Six weeks has been recommended by the Conference of State and Territorial Health Officers with the Surgeon-General of the Public Health Service as sufficient, and this period has been generally accepted throughout the United States.

3. Disinfection of all body discharges.

4. Restriction of the movements of intimate associates of the patient so far as practicable. This should include at least exclusion of the children of the family from schools and other gatherings.

5. Protection of children so far as possible from contact with other children or with the general public during epidemics.

6. Observation of contacts for two weeks after the last exposure.

There is no specific treatment of established value in poliomyelitis. During the persistence of the acute symptoms of the disease the important principles of treatment are rest in bed, symptomatic relief, and passive support for the prevention of deformities. Active measures during this stage are not only useless but are apt to cause serious and often permanent injury. Hospitalization of patients where possible is to be encouraged. The best chances of recovery from residual paralysis demand skillful after care, often long continued, and always under the direction of a physician familiar with the neurological and orthopedic principles of treatment. The provision of such after care often becomes a community problem, demanding the coöperation of all available agencies, social and professional.

MR. STRONG'S REPORT ON STATE CHARITIES.

"On Friday of last week Governor Whitman made public the report of Charles H. Strong, his special commissioner appointed a year ago to examine into the management and affairs of the New York State Board of Charities, of several related boards and commissions, and also into the charges brought by the city Department of Public Charities against the inspections by the state board of private institutions receiving money from New York city.

"Mr. Strong upholds the charges of the city and recommends a thorough reorganization of the State Board of Charities, as well as the abolition of several boards and commissions. A critical estimate of his conclusions will appear later in the *Survey*. Only a summary of his major findings will be given here.

"The city proved its case, Mr. Strong finds, 'out of the pages of the state board's own inspection reports.' Private institutions receiving money from New York city and subject to the inspection of the state board care for more than 25,000 dependent children. The charge that many of these institutions were 'unfit for human habitation' Mr. Strong declares untrue. This was made in the testimony before him of John A. Kingsbury, city commissioner of public charities. On the other hand, the charge that conditions in many of these institutions bearing the certificate of approval of the state board were 'such as to be little less than public scandal and disgrace,' Mr. Strong finds to be true. This was made in Mr. Kingsbury's report to Mayor Mitchel, which was forwarded to the governor and formed the basis for including this phase of the inquiry in Mr. Strong's commission. Seven, at least, of the twenty-four institutions on the city's controverted list must be thus described, says Mr. Strong.

"For permitting such conditions to grow up and to continue Mr. Strong finds the state board responsible. . . . "—*Survey*, November 4.

Book Reviews.

American Public Health Protection. *Henry B. Hemenway. Bobbs-Merrill & Co., Indianapolis, Ind., 1916. Price, $1.25 net.*

This book shows that in spite of the short comings of the American social structure we have come a long ways in the protection of public health. The frames of the constitution gave the matter no concern, and very clearly made no provision for it. As the growth of the commonwealth demonstrated the necessity for such protection, the law makers have slowly responded to the demand, and the courts have gradually widened the interpretation given the welfare and commerce clauses of the constitution in order to approve the validity of such laws.

Nevertheless, our best accomplishments in the control of disease have been in lands under the control of our War Department, and Hemenway quotes Bryce as showing that these accomplishments were possible because the central autocratic authority was not limited by laws, or even by democracy. The accomplishments were not by reason of Americanism, but rather in spite of it.

Again, he quetes MacDonald's comment upon the American government, that it erred in leaving all power save that specifically vested in the central government, in the local government. MacDonald was advocating a basic law for Canada under which all power was in the central government save that specifically conferred on the provinces.

Hemenway is clearly in favor of a centralized autocratic authority, but pending its accomplishment, he insists in this book, as he has in his other works, that all acts of all adminstrators shall take the fullest cognizance of all the laws based upon all the decisions. It is not always easy to make these two points of view coincide.

The law of procedure is always reactionary. To bring about a centralized autocratic health authority requires that law shall remain in a state of flux.

The author refers to his legal arguments to prove that under the constitution the National government has the right to directly collect vital statistics, reports of births, deaths and morbidity, marriages and divorces not at ten-year intervals, but day by day.

If this be granted, and he tells us that the highest legal authorities recognize its validity, it will inevitably follow that in time other skillful legal minds will be able to assemble proofs, scientific, sociologic and legal, for the taking over of such work for the people's welfare as the books of the Vital Statistics Department show to be necessary or advantageous for the welfare of the state.

But it is not in the interest of the people that such authority should be granted health officers until those holding such positions are better qualified than they now are. In order that they shall be better qualified, the author makes several suggestions. The first is, that the public should not dabble too much in health matters. "In the place of trying to decide how dairies should be managed, they should make sure that a competent health officer is employed and then follow his lead." There would be advantages in this plan, but we cannot secure them without abandoning democracy. The best we can possibly get is to train the people to interfere with judgment and discretion.

His second is, that competent health officers should be sufficiently paid, and that they should be retained in service during good behavior. As the custom now is a man is not justified in expending the time and money necessary to equip himself for the duties of a health officer.

The third is, that there be better facilities for the study of preventive medicine.

The author is definite in his opinion that the ordinary course in curative medicine taken by the physician does not qualify him for the duties of a health officer. Furthermore, the opinions of a practicing physician on methods of preventing disease are often worse than valueless. A physician cannot practice curative medicine and at the same time discharge his duties as a health officer with advantage either to the community or to himself. When it comes to stating just how the health officer shall be trained, the author is not so definite. I confess that I am hazy as to the details of the training that he should have. The course in public health

should not be founded on the degree of medicine. As to that I feel certain of the author's opinions.

It does not seem that he would have it be specialized over-much. He is against, for instance, limiting surgery to surgeons who have a special degree, telling of the discoveries by country surgeons who would have come under the ban of such a requirement. He thinks highly of courses of instruction in law, sanitation, engineering and medicine, of health officers' schools and associations. Probably we have not reached the point where any one wants to say definitely and concretely just where and how the health officer shall be trained.

W. A. Evans, M. D.

The Control of Hunger in Health and Disease. *By Anton Julius Carlson. Chicago University Press, 1916. Pp. 319. Price $2.00.*

This is a work of unusual interest. For several years the author has been privileged to make observations upon an intelligent subject who has a large gastric fistula. The opening was made long ago to permit feeding after closure of the esophagus. It is of a size to admit various recording instruments to the stomach. Doctor Carlson and his associates have supplemented their experiments upon this individual with many others upon themselves and on animals. The total mass of their results is impressive and testifies to their industry and ingenuity. Moreover, these results are assembled and discussed with excellent judgment.

The "hunger" of this treatise is an objective phenomenon, a strong, recurrent contraction of the empty stomach. It is the cause of a gnawing pang but can be recognized by the movements of a manometer as well as by its token in consciousness. Thus it can be studied in dogs and rabbits. This primitive hunger is distinct from appetite which is assumed to be essentially mental, compounded of recollections and anticipations. The hunger contractions are found to have the following characteristics: They are more frequent and powerful in young than in older animals. They do not cease in long fasting though human experience shows that they are less and less vividly felt. They are aggravated in diabetes and kindred conditions. A variety of sensory stimuli, especially the tasting of food, may cause them to be inhibited. Acid introduced into the stomach suppresses them and this is a factor which operates when gastric juice flows at meal time. The nervous mechanisms concerned are localized in the stomach wall though inhibition of central origin is common.

There are many incidental observations. Among them we have the fact that the "empty" stomach usually contains an ounce or two of fluid. Its walls secrete gastric juice slowly but continuously during fasting. The secretion after feeding is surprisingly copious; the total daily volume may reach 1500 cc. The acidity may be higher than we have supposed, as high as 0.5 per cent. HCl.

P. G. Stiles.

THE DECEMBER JOURNAL.

SYMPOSIUM ON MENTAL HYGIENE.

Psychiatric Clinics in the Schools. Dr. J. T. MacCurdy, Consulting Psychiatrist, Institution for Feeble-Minded, Randall's Island.

The Relation of Alcohol and Syphilis to Mental Hygiene. Dr. Frankwood E. Williams, Secretary, Massachusetts Society for Mental Hygiene, Boston, Mass.

The Relation of Social and Economic Factors to Mental Hygiene. Dr. C. MacFie Campbell, Henry Phipps, Psychiatric Clinic, Johns Hopkins Hospital, Baltimore, Md.

A National Program of Education for Mental Hygiene. Dr. Thomas W. Salmon, Medical Director, National Committee for Mental Hygiene, New York City.

Health Department Reports and Notes.

REPORTS.

Jacksonville, Florida.

Among the many reports received by the JOURNAL during the year, there are a few which we wish could be made the standard for all others, and year after year among that few we can always recommend the report of the Jacksonville Department of Health, under the able supervision of Dr. C. E. Terry. Using his keen insight into public health conditions and applying his knowledge of the most modern means of combating disease, Doctor Terry has yearly reported the conditions of his city in a most effective manner, giving ample and excellent interpretations of the vital statistical data, and drawing his conclusions and setting forth his recommendations in a most convincing manner. In preparing this report for 1915, the similarity of the work of that year with the work of previous years was brought forcibly to his attention. It was evident that no better results could be accomplished under the existing organization of the health department since it had reached its maximum efficiency. As a consequence many radical changes are suggested. These will be considered in the recommendations.

During 1915 there occurred in this city of 73,137 population, 530 white and 824 colored deaths, a death-rate of 14.7 and 22.1 per 1,000 respectively, giving a general death-rate of 18.5 per 1,000. It will be noted how greatly in excess is the colored death-rate.

Smallpox returns showed the smallest number of cases on record, 151. It is considered that this is a direct result of the 1912 campaign against this disease, when 30,000 people were vaccinated.

151 cases of diphtheria were reported, with 16 deaths. It is of interest to note the great disparity between the cases reported for the white and colored races; the former gave 129 cases, while the latter gave only 22 cases, though the deaths were 8 each. This apparent racial difference to susceptibility to this disease is explained on several bases. Foremost is the racial apathy to the danger signals of acute infections, resulting in the non-reporting of mild and moderate cases of all communicable diseases, allowing them to run their course without medical supervision. Another reason for the very incomplete case reports is the failure of many of the colored physicians to make use of the laboratory of the state board of health to assist them in diagnosis. The third reason listed is the absence of medical inspection among colored school children. An excellent discussion accompanies the section devoted to this disease, especially in connection with the resulting sixteen deaths. The short review of the fatal cases shows the factors which largely determine the mortality of diphtheria in any epidemic, chief of which is ignorance. Scarlet fever, measles, rabies, malaria, and whooping-cough seem well under control. The tuberculosis mortality-rate has remained practically stationary since 1911. In 1915 this disease was responsible for 158 deaths, 32 white and 126 colored. To lessen the number of deaths further from this disease, considerable increase in the nursing force is needed, also institutional care for cases of this disease, particularly among the colored population. There was a typhoid death-rate of 19.1 per 100,000, the lowest ever recorded in Jacksonville. Of the 92 cases reported, 58 originated in the city, which caused 8 of the 14 deaths. This sustained and spectacular reduction of the typhoid-rate during the last five years is attributed directly to the ordinance governing the construction and maintenance of privies, relating especially to fly-proofing. Pellagra is assuming an important position among the causes of death in this city. During 1915 it caused 51 deaths, giving a mortality-rate of 69.7 per 100,000. Prior to this year the highest rate had been 24.9 in 1912. Considerable difficulty is being experienced to install any control measures for this disease on account of the incomplete reports of cases and the fact that often the first the department learns of a case is through the death certificate.

Moreover, it is the opinion of the health officer that the problem is an economic rather than a health problem.

The infant mortality-rate was further reduced in 1915 to 82.9 per 1,000 births, the lowest yet recorded. This excellent record is attributed largely to the work of the Infant Welfare Society's nurse and the colored visiting nurse. Of material assistance also in this reduction was the midwifery ordinance, which necessitates the licensing of midwives, and furnishes them with elementary instruction in the performance of their duties. Such licensing subsequently diminished greatly the number of midwives practicing. Prior to the passage of this ordinance, the percentage of births attended by midwives was 51.7 for the period of five years. It has been reduced for the reported year to 40.6 per cent. A further gratifying sign of improvement in the methods of these women is the continued reduction of the number of deaths from the so-called "tetanus period" which are understood to be deaths occurring between the fifth and eighteenth days of life, which the department believes are in many cases attributable to tetanus neonatorum. It was mainly the great preponderance of deaths in this period of life of babies attended by midwives over those attended by physicians that caused the passage of the midwifery regulations. The chart accompanying this phase of the report clearly shows the effectiveness of the regulation. At present the midwives, aside from their instruction, are supplied with sterile umbilical dressings.

It is of interest to note in this report a short section devoted to habit forming drugs. After the passage of the Harrison Act, provisions were made, through private philanthropy, for the treatment of drug addicts unable to pay for such service, at one of the city hospitals. As a result 67 were so treated, outside of those treated in private institutions, and today it is believed that few narcotic users are in the city. In this connection two state laws have been passed of an extremely creditable nature. One is aimed at the physician careless in the distribution of opium derivatives and cocaine, and the other provides treatment at the state insane hospitals for indigent addicts.

We have already referred to the proposed partial reorganization of the department, since the present arrangement is incapable to cope with various problems of public health administration in accordance with the most modern methods. To quote the report:

"As our knowledge of factors, both direct and contributory, in morbidity from communicable causes increases, it is daily more apparent that preventive measures, to be effective, must follow lines different from heretofore. As new avenues of infection are recognized, new barriers must be erected; contact rather than air or fomites has, during the last decade, come to be recognized as the one most common mode of disease transference. To meet it we must abandon the pest house idea and backyard cleanliness and concern ourselves with the family kitchen and the habits of each member of the household; food infection calls for modern laboratory equipment; the various insect-borne diseases for a revision of our building laws and, interwoven with each of these gross sources of danger, is the individual himself, his habits and modes of life, his care and carelessness, his responsibility as a unit, safe or dangerous to community welfare. Second only to the havoc his ignorance may play with others, is its danger to himself,—to be safe he must be immunized with knowledge, he must learn about contact and cleanliness, about filth and disease, he must be constituted an integral part of our armamentarium rather than an obstacle to our sanitary progress.

"This problem of the individual and his close bearing on community health requires special methods of approach—it means that we must cross the home threshold and mingle, more or less intimately, in the life of the family; from oldest member to the youngest child must a protecting watchfulness be exercised and, further even than this perhaps, shall our most valuable efforts be directed at the generation yet unborn."

The chief change suggested is the substitution of six sanitary inspectors, whose training does not prepare them in any way to undertake this new work, for six nurses, whose training as well as sex will enable them to become intimate with the mothers and children of the household, and also will make it possible for the city to extend its welfare work to every section of the city. As it is now the sanitary inspection department spends in salary some $19,400 for the prevention of some 34 deaths; while the nursing department of one third the above staff, and with the expend-

iture of only $8,300 has direct connection with the prevention of some 307 deaths a year. It is also desired to increase the number of colored visiting nurses. This year only one was employed, and the results she accomplished were remarkable. Such an increase in the staff would be a material factor in reducing the enormous colored death-rates, which seems to be characteristic of all southern cities.

Doctor Terry also recommends strongly the early passage of laws governing the production of dairy and creamery products other than milk, of bread stuffs, bottled waters and soft drinks; of one dealing with the construction and maintenance of abbatoirs and the inspection of food animals locally slaughtered, and of more importance, in view of the climatic conditions, of suitable laws regulating the construction and maintenance of stables with special reference to the eliminating of rat- and fly-breeding places.

The various subreports speak equally well of this department's activity and excellent results. It is of especial importance to note the growth of the laboratory under the direction of Dr. W. G. McKay. Obviously all departments have contributed to make this report so creditable. The discussion of the records and results are put forth in a clear and concise manner, and the small special tables and graphs are particularly of value. The per capita expenditure is approximately fifty-three cents for health work. In conclusion we can most heartily endorse this report, not only for the general excellency of the presentation of its health conditions, but, too, for lucid and keen deductions of health matters as put forth by the chief health officer.

Winnipeg, Manitoba.

This northern city reports the extremely low death-rate of 8.73 per 1,000 population, based on a population of 201,981, the lowest death-rate on Winnipeg's record. It is the belief, however, that the death-rate is actually higher than this, for it may be that the estimated population is too high, and it is obvious that, due to the unstable conditions existing in the city, an accurate estimate of the population can not well be made. Notwithstanding this doubt, however, the death-rate is very favorable.

The Department of Health also reports another record broken. The infant mortality rate per 1,000 reported births is 106.3, in comparison with the 1914 rate of 125.2. Doctor Douglas, the medical officer of health, is extremely gratified with this showing, and believes that the true rate is even lower, since he feels perfectly certain that many births have not been reported. It seems that notifications of birth are not made to the Health Department, but a rearrangement is being made of the Vital Statistics Act, which promises to make it possible to have adequate registration carried out. Much credit for this reduction in the infant death-rate is extended to the Babies' Milk Depot and other agencies, which carried out their work with a high degree of efficiency.

One hundred and fifteen cases of typhoid were reported during the year, of which seven died, giving a death-rate of 3.5 per 100,000, against a rate of 7.9 in 1914. Sixty-one of these cases originated outside, resulting in two deaths, thus giving a corrected death-rate of 2 per 100,000. No group of cases was traceable to infected water or milk throughout the year. Sixteen cases of smallpox were reported, eight of which were imported from the outside, in comparison with 108 of the previous year. Both morbidity and mortality rates from measles, scarlet fever, whooping-cough, and diphtheria showed in most cases marked reduction from the records of 1914, though it is the opinion of the department that the rates are still much too high, especially in the case of diphtheria, cases of which numbered 463 with 44 deaths. It is interesting to note that in respect to whooping-cough, Doctor Mathers of the King George Hospital reports that of a group of nine patients receiving vaccine, all were entirely free from cough on an average of fifteen days from commencement of treatment. Two had completely recovered in seven days. "It is altogether probable," states this report, "that it is owing to the employment of this treatment that we can point this year to the second lowest rate we have recorded." This is of particular importance when we consider that during the last two years considerable experimentation has been carried on as to the applicability of serum therapy to this disease.

Tuberculosis showed a gain during the year. In 1915 deaths from tuberculosis in all forms aggregated 194, a death-rate of 96 per 100,000. In 1914 the death-rate was 92.5. Though the increase is not very great, it is the opinion of the health officer, that it is "sufficient food for thought." Among the proposals to combat this disease are suggested the appointment of another nurse, the establishment of a night clinic, the pasteurization of the total milk supply, and better notification and further coöperation and help on the part of the physicians and public.

During the year much creditable legislation has been enacted, both for the Province of Manitoba and the city of Winnipeg. These laws deal with sanitation and inspection of lodging houses and hotels, and of portions of buildings below the street level, the ventilation and lighting of all dwelling places, the licensing of milk vendors by the Food and Dairy Inspector, rather than by the License Department, and the prohibiting of bottling of any milk or cream on any premises not licensed for that purpose.

Space does not permit us to review in detail the excellent subdivisions of this report. It is obvious, however, that their work has been carried out with great thoroughness and ability, as evidenced by the general reduction of morbidity and mortality rates, and by the spirit of progress and energy displayed throughout this report. Winnipeg expends a total net health department expenditure per capita of 91.4 cents. The results of this comparatively liberal per capita expense are obvious. It is a lamentable fact that many cities of the United States are striving for better health conditions on a per capita expenditure of hardly half of that of Winnipeg.

NOTES.

Profiting by Experience with Infantile Paralysis.—Now that the greatest outbreak of infantile paralysis in history is on the wane, most health departments, through their weekly and monthly bulletins, are commenting on their experiences with the epidemic and the benefits derived from such experiences. Of particular merit is the comment made by the New Jersey State Health Department in its September *Public Health News*.

This Department believes that the gains from the poliomyelitis epidemic relate more to other diseases than to poliomyelitis itself, especially to general problems of public health administration. Some of these gains are as follows:

1. The general awakening to the necessity for public health work. It is true that the public has seldom been so aroused over an outbreak of disease as over the recent outbreak of paralysis. Such an awakening will undoubtedly result in a demand for better public health work, and consequently it will bring about a willingness on the part of the public to provide the facilities for such work. The Bulletin believes that this one gain should soon more than compensate for this year's loss from the epidemic.

2. Hospitalization of all cases of communicable disease. Focussing of public attention upon this important means of preventing the spread of communicable disease should lead to a much further development of the hospital treatment of such diseases, a thing which has been approved and recommended by health authorities for many years.

3. Local health boards in rural communities, mere paper organizations. This Department believes that the outbreak of poliomyelitis has demonstrated to the public the utter worthlessness of many of the boards of health in the townships and rural communities, and even in some boroughs and towns.

4. Local units of health administration too small. It is believed that the majority of these units are so small that sufficient funds cannot be provided for adequate public health work by a reasonable rate of taxation, the result being that the health work is left undone.

5. Necessity for specially trained full-time local health officials. It is obvious that the untrained man has frequently been tried in health work and found wanting, because the health protective measures of today are so diversified and so specialized that few without special training can carry them out.

6. Concentration of health activities. Only by the concentration of all public health activi-

ties of a community in one man can effective work be secured.

7. Uniform regulations throughout the state. The inconvenience, annoyance and resulting inefficiency due to the enforcement of different regulations in each sanitary district has been forcibly impressed upon the public during the recent outbreak.

8. State sanitary supervisors. New York, Massachusetts, and other progressive states have such supervisors. New Jersey wishes to follow their lead, realizing the benefit to be derived from the assistance to rural boards of health which these men can furnish.

9. Special emergency appropriation. Obviously, to fight disease it is necessary that ample funds be made available for any special outbreak which may arise.

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Public Bathing and Infection.—Recently, in Chicago, there occurred a death from infection resulting, as reported, from exposure in lake bathing. There have also been reported a number of cases of serious sickness of a similar nature during the past summer months. The Chicago Health Department, in its weekly bulletin of October 7, comments to some length on this subject, as follows:

"That the water at the beaches may be especially unclean at certain times, when there is little wind and the lake currents are not strong, may be easily imagined when many thousands of bathers are in the water. That the individuals who frequent the bathing beaches may add many elements of contamination to the common bath is fair to say.

"It follows that if the water thus contaminated by tens of thousands of human bodies gains entrance into the nose, ears, eyes and throats of bathers, or is swallowed by them or aspirated into their bronchial tubes, infection may follow, particularly if the physical resistance of the bathers is lowered, favoring infection.

"It is not surprising then that many cases of ear trouble or inflammation of the eye or nose or sore throats have occurred. Physicians have had many cases to treat this summer.

"Where the sickness takes the form of bronchitis or pneumonia, it may be due to extension of the infection from the nose or throat, or because water has been drawn into the lower tubes.

"Infection may also occur on the external skin, in the form of boils, when the natural protective oil of the skin has been removed by prolonged soaking in the water, by friction, or when the skin has been injured by the sun.

"It follows that proper care should be taken by those who patronize the bathing beaches and various swimming pools and public bathing places."

To those who frequent natatoria and bathing pools during the winter months as well as to those who are to use the outdoor pools and beaches next summer, the following rules are advocated by the Department:

Never take the water in your mouth.

Never swallow such water.

Avoid drawing water through the lower breathing tubes.

A little vaseline in the external ears and nostrils will help to prevent infection.

Do not stay in the water too long.

Do not open your eyes when diving under water.

If evidence of infection occurs on the skin, in the ears or eyes, nose or throat, see your physician promptly.

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The Low Infant Death-Rate of New York City so far this Year.—The first thirty-seven weeks of 1916 have shown interesting and gratifying reports in connection with the activities of the Department of Health and the allied agencies in reducing the infant mortality rate of that city.

According to the weekly health bulletin:

From January 1 to September 23, 1916, there have been 942 fewer deaths under one year of age than there were for the corresponding period of 1915. This reduction has been distributed throughout the year, but the past fourteen weeks hold particular interest, inasmuch as during that period the city has been suffering from an extensive outbreak of poliomyelitis.

As 10 per cent. of the total number of cases of poliomyelitis occur in babies under one year of age, it might reasonably be expected that this increase in the death-rate from this disease might show an effect in an increase in the total infant death-rate. However, such has not been the case.

For the fourteen weeks beginning June 24 and ending September 23, including the period when the outbreak of poliomyelitis has been most

active, there have been 385 fewer deaths of babies under one year of age for the City of New York than there were during the corresponding fourteen weeks of 1915. This gain is due to the marked reduction which has been shown in the deaths from gastro-intestinal disorders, as there have been 624 fewer deaths from gastro-intestinal diseases, in infants under one year, during the fourteen weeks above mentioned than there were for the corresponding period of 1915.

This marked decrease in deaths is significant in that it would seem to show better care given to babies in general, on account of the anxiety of mothers because of the poliomyelitis epidemic. It is possible that there has been a certain amount of error in the diagnosis of cases of poliomyelitis and that some cases of gastro-enteritis resulting in death have been diagnosed as due to poliomyelitis. It is believed, however, that the margin of error is very small, as all deaths where the diagnosis was not clearly evident have been carefully investigated by the department, and errors have been eliminated before making up the final figures.

The work of the Bureau of Child Hygiene during this period has been greatly increased, inasmuch as many mothers have been afraid to bring their babies to the Department's Baby Health Stations. This, of course, has involved more continuous and widespread home visiting on the part of the nurses of the bureau.

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California Attacks a New Problem.—Believing that mental diseases, as well as the more common infectious diseases, should come under the administration, at least surveillance, of the health department, the California State Board of Health has a committee which is investigating the present method by which the insane and drug habitues are "arrested, incarcerated, examined, and committed to state institutions."

From the preliminary report of the committee, according to the September monthly bulletin of the State Health Department, it is apparent that:

"The prevention of insanity and drug habits would be materially advanced by adequate study of mental and drug cases by experts before commitment. Under the present system many patients are never seen by a competent alienist until after they have been legally committed to an insane hospital. The average physician is no more able to diagnose mental disease accurately and pass on the need for commitment than he is able to practice that other important specialty—public health. Both involve responsibility which cannot be met without special training and extensive experience. Mental disease and addiction to drugs, including alcohol, add greatly to the sum of human misery. The state needs psychopathic hospitals where the cases can be studied to determine the need for commitment, the type of institution to which the patient should be sent, and the possibility of avoiding formal commitment by a prompt cure at the observation hospital. Such study would greatly further the prevention of dependency from mental disease."

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The Public Health Council of Buffalo.—Health Commissioner Fronczak has appointed a number of physicians and laymen to assist him in an advisory capacity in all important matters of health and sanitation, and to be known as the Public Health Council. The principal questions for this committee to consider will be such as involve a radical change of procedure from established practice. The commissioner feels that after an impartial body of men and women residents of Buffalo have placed their stamp of approval upon such measures, the public will be better satisfied and the Commissioner cannot be accused of being either too severe or too lenient.

Commissioner Fronczak is extremely gratified with the hearty coöperation already given him by this committee at its first meeting in the mayor's office. Each member present indicated by voice or action his or her approval of the plan, as outlined by the Commissioner.

It is the intention not to impose upon the time of these very busy people. They will be sent, in advance, an epitome or brief outline of whatever is to be presented at each meeting, so that they may come prepared to act. In this manner each session ought not to last more than half an hour, will be called only when necessary, and will begin promptly on time.

At the first session the time was taken up in outlining the work of the committee and hearing the opinions thereon by those present. The next meeting will begin with the actual work.—*Buffalo Sanitary Bulletin.*

A Simple Method of Pasteurizing a One-Quart Bottle of Milk.—In the September *Health News*, the monthly health Bulletin of the New York State Department of Health, Miss Ruth Vories, Laboratory Assistant of the Division of Laboratories and Research, describes a series of experiments planned to determine a simple method of pasteurizing a one-quart bottle of milk, "a method which would insure pasteurization yet be practical for every housewife to carry on in her own kitchen with ordinary utensils."

The following plan, inasmuch as the maximum temperature was not as high as to injure the milk and since the temperature in this milk was held at 60 degrees C. for over thirty minutes, assures thorough pasteurization without undesirable changes.

1. Boiling 2½ quarts of water in a large agate saucepan, or better

2. Boiling 2 quarts of water in a 10-pound tin lard pail, placing the slightly warmed bottle from ice chest in it, covering with a cloth and setting in a warm place. At the end of one hour the bottle of milk should be removed and chilled promptly. *The water must be boiled in the container in which the pasteurization is to be done.*

Exploiters of Fraudulent Cures Prosecuted.—The New York City Department of Health has succeeded in obtaining jail sentence and substantial fines as penalties for two charlatans who attempted to exploit fraudulent cures for poliomyelitis in that city.

We quote from the weekly bulletin of the New York City Department of Health the history of the two cases:

"The story of the case of Mr. Frooks is as follows: Frooks manufactured and sold a kind of amulet to be worn around the neck to protect the wearer from infantile paralysis and other diseases. Analysis by the Department of Health Laboratory showed that the amulet consisted of a cotton bag containing cedar wood shavings. Frooks was successfully prosecuted for representing that the wearing of this bag would protect the wearer from infantile paralysis. In finding him guilty and pronouncing sentence, the Court expressed its condemnation of the vicious and cruel exploitation of the public. Frooks was condemned to spend thirty days in jail and to pay a fine of $250.

"The story of the case of Manchester is as follows: A preparation called 'Sol,' manufactured and sold by the defendant, James T. Manchester, was represented as being a cure for infantile paralysis, consumption, rheumatism, and other ailments. This preparation, on analysis, was found to consist essentially of capsicin, sassafras and alcohol. In view of the vicious type of violation of the law, the magistrate sentenced the defendant to thirty days in jail.

Some Community Measurements.—We are indebted to the monthly bulletin of the Indiana State Board of Health for the following unusual statements:

"*Dyspepsia.* The amount of dyspepsia in any community is in direct proportion to the hasty eating of improperly cooked foods, by the average citizen.

"*Diphtheria.* The mortality from diphtheria in any community is in direct proportion to the failures to early administer antitoxin, by the average citizen.

"*Syphilis.* The amount of syphilis in any community is in direct proportion to the amount of illicit commerce, by the average citizen.

"*Gonorrhœa.* The amount of gonorrhœa in any community is in direct proportion to the amount of wild oats sowed by the average citizen.

"*Insanity.* The amount of insanity in any community is in direct proportion to the amount of syphilis and alcoholism of the average citizen.

"*Bad Breath.* The amount of bad breath in any community is in direct proportion to the decayed teeth and intestinal indigestion of the average citizen.

"*Typhoid.* The amount to typhoid fever in any community is in direct proportion to the quantity of human excrement consumed by the average citizen.

"*Tuberculosis.* The amount of tuberculosis in any community is in direct proportion to the quantity of foul air consumed by the average citizen.

"*Infantile Mortality.* The amount of cholera infantum and infantile diarrhœa in any community is in direct proportion to the amount of food poisons consumed by the average infant.

"*Smallpox.* The amount of smallpox in any community is in direct proportion to the neglect of the average citizen to be successfully vaccinated.

"*Arteriosclerosis.* The amount of arteriosclerosis in any community is in direct proportion to the amount of auto-intoxication acquired by the average citizen."

*

The Teachers' Institute.—During the two weeks postponement of the opening of school in New York City, teachers' institutes were held throughout that city. This naturally afforded a splendid opportunity for representatives of the health department to meet the teachers and impress on them the importance of health instruction to school children, and to point out ways in which such instructions could be effectively applied.

According to the weekly bulletin of the city health department:

"Special emphasis has been laid on the new syllabus on hygiene prepared for the use of school teachers by the Bureau of Educational Hygiene of the Department of Education. In planning the work, the object has been to keep in mind practical affairs of daily life, such as keeping scalp and hair clean, brushing the teeth, attending to clothing, study, play and rest. Each topic is thus related to daily living. The instruction is tested by inspection and by questioning the pupils as to their success in putting into practice the teaching of previous lessons. Such instruction will interest the pupils in the formation of good hygiene habits and will result in application of the lessons of personal hygiene to the home, neighborhood, school and city.

"The consideration of any special topic is not necessarily limited to any special time. While all the topics given in the lessons are adequately covered during the term, principals are empowered to make appropriate adjustments to the neighborhood needs.

"Every morning 800,000 pupils will be given their daily hygiene inspection. In some schools this will be very formal and military. In others it will be very much like the looking-over careful mothers give their children when they get them ready for school. Cleanliness is to become a habit in which the children will take a personal pride. Class records may be kept on charts hung up in the classroom for everyone to see. This will be adapted by the principal of each school to the special needs of his children."

If the course of instruction outlined in the syllabus is followed, the school children of this city should soon become one of the most powerful factors promoting the health of the community.

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1917 Budget of New York City Department of Health for Health of School Children.—The 1917 budget estimate of the Bureau of Child Hygiene of the New York City Health Department calls for 875,240 more than last year for school health work. The additional money is needed for enlarging the staff of medical inspectors and nurses so as to reduce the present proportion in the number of children to physician and nurse to a better working basis. Six dental hygienists are also asked for who are to be engaged in prophylactic work and giving surface treatment, thereby adding considerably to the preventive as well as curative services at present available in the schools and clinics. The following table shows the present and proposed staffs:

	1916.	*1917.*	*Increase.*
Medicial Inspectors.....	100	125	25
School Nurses.....	200	252	52
Dental Hygienists.....		6	6

The 1915 reports on medical inspection show that out of over 925,000 pupils enrolled in the public and parochial schools, only 305,665 or 33 per cent. were examined for physical defects, leaving a large percentage among the two thirds of the enrolled children not examined possibly suffering from various physical defects, which in their very nature are a handicap to school progress. Of the children examined, 222,072 or 72.6 per cent. had physical defects requiring treatment as follows: defective vision, 14.5 per cent.; defective nasal breathing, 9.5 per cent.; hypertrophied tonsils, 11.2 per cent.; defective nutrition, 5.3 per cent.; defective teeth, 63.9 per cent.; and to a lesser extent there were cases of cardiac and pulmonary diseases, defective hearing and orthopedic defects.

The large number to be examined and the small staff of physicians available made it impossible at times to give each child a complete physical examination, with the result that 129,125 or 42.2 per cent. of the children examined did not have their vision tested.

The large percentage of unterminated cases under treatment or investigation proves the insufficiency of the staff employed for this vast

and important task. As much of the curative work done by private physicians or at clinics is due largely to the follow-up efforts of the school nurses, this phase of the health supervision cannot be conducted as effectively as desired unless an adequate staff of nurses is provided.

Both these handicaps in the results of the year's work are due to the large number of pupils assigned to each physician and nurse, being respectively 9,200 and 4,800, whereas the ratios should never exceed 3,000 in either case. The appointment of the additional physicians and nurses asked for will reduce but slightly this ratio.

Ratio of Pupils to Physicians and Nurses.

	1916.	*1917.*
Pupils to physician	9,200	7,400
Pupils to nurse	4,800	3,666

Public safety demands the quick recognition and exclusion from school of all cases of infectious disease. The health and efficiency of each individual child demand the discovery of any physical defects which may have a deleterious effect, not only on his well-being but also on his educational progress. Without the proper number of physicians and nurses indicated above, it is believed that neither of these important requisites can be observed.

⁂

Campaign Against Lake Pollution Yielding Results.—The constant and persistent efforts made to preserve the purity of Chicago's water supply are yielding results. Figures just compiled in the Department of Health show that the typhoid rate of the city during the first eight months of this year is 6.2 deaths per every 100,000 inhabitants. Last year the typhoid rate was the lowest in the history of the city.

A summary of the samples of water taken from the various pumping stations supplying the city, analyzed during the first eight months of this year, indicates that only 0.28 per cent. of the samples showed distinct evidences of pollution,—that is, colon bacilli in 1 cc. of water.

Continuous improvement in the water supply is shown in the following table prepared by the Director of the Laboratory:

Year.	Per cent. of samples containing colon bacilli in 1 cc.
1911	18.1
1912	11.3
1913	5.3
1914	4.5
1915	2.7
1916 (1st 8 months)	0.28

The material improvement since 1912 is, for the most part, attributed to the hypochlorite and chlorine treatment recently inaugurated.

⁂

School of Civics and Philanthropy.—The Department of Public Welfare of the City Government of Dallas, Texas, in collaboration with the United Charities of that city, have recently organized a school of Civics and Philanthropy. This school includes a division of Health Protection for which the Director of the Department of Public Health, Mr. Charles Saville, has arranged a series of twenty-five lectures. This series of lectures embrace the following ten main topics: I. Health Education; II. Communicable Diseases; III. Non-Communicable Diseases; IV. Milk, Food, Water and Air Supplies; V. Wastes Disposal; VI. Soil Pollution; VII. Housing; VIII. General Sanitation; IX. Indigent Sick; X. Administration of Public Health Work.

⁂

Pertussis Vaccine.—On October 1 the New York City Health Department's whooping-cough clinic was discontinued. This clinic was established more than two years ago for the purpose—now completed—of gathering data on the therapeutic value of a specific vaccine for whooping-cough. While the results will not be published in full for some time, it is stated that the vaccine has a distinct field of usefulness, and that its use should be encouraged.

New York physicians wishing to use the Health Department's Pertussis Vaccine may obtain it, gratis, on condition that they make a full report of their cases to the Department. Printed directions are given out with the vaccine.

Public Health Notes.

Should Terminal Disinfection Be Abolished?—Under this caption, an exceedingly interesting symposium is presented in the September number of the *Medical Times* by the following well-known sanitarians: R. H. Creel, Assistant surgeon-general, U. S. P. H. S.; Linsley R. Williams, M. D., deputy commissioner, New York State Health Department; H. W. Hill, M. B., M. D., D. P. H., director, Institute of Public Health, London, Canada; Charles S. Caverly, M. D., President, Vermont State Board of Health; John Dill Robertson, M. D., commissioner of Health, Chicago; Joseph S. Neff, M. D., Philadelphia.

Owing to the pressure of the infant paralysis epidemic, the officials of the New York City Health Department did not prepare a paper, but sent as their contribution the data issued at the time terminal fumigation was discontinued.

In reply to the question, New York City, Creel, and Hill vote "Yes," and consume seven columns of space in explaining their views. Caverly, Robertson and Neff say "No," and find one column of space sufficient.

Turning to the reasons given by the affirmative, we find the following:

1. New York City and other cities have proven that the discontinuance of terminal fumigation was not followed by an appreciable increase of "after cases";

2. The frailty of the microörganisms of scarlet fever, measles, and diphtheria is such that their existence outside of the human body is very brief;

3. The penetration of gaseous disinfectants is not high enough to disinfect except on surfaces;

4. Thorough disinfection by means of solutions is practically impossible; amounts as at present used are inadequate;

5. Concurrent disinfection is better;

6. Members of the infected household have, by the time the patient has recovered, demonstrated their immunity, and later visitors have practically no contact;

7. The necessity for the practice has not been justified with bacteriological studies;

8. Such epidemics as have been traced accurately have almost invariably been traced to milk, or to contact, and not to inanimate objects;

9. The money spent for terminal disinfection is needed for other measures whose usefulness has been definitely established.

Of the anti-abolitionists, the most positive stand is taken by Dr. Robertson, who says that "until the bacteriologists determine that pathogenic germs have no life history worthy of attention outside of their hosts, I will favor terminal disinfection in cases of contagious disease."

The statement of Dr. Neff is given in full:

"Notwithstanding terminal disinfection is useless in some communicable diseases, and much is unnecessarily done, yet to abolish it is absolutely out of the question. It might be discontinued in such diseases as diphtheria, measles, etc., but should be continued in tuberculosis, smallpox and some other diseases, the means of transmission of which we know little about."

Dr. Caverly, while admitting that perhaps too much stress has been laid upon this phase of preventive medicine, feels that we are in danger of going to the other extreme in abolishing terminal disinfection entirely. He continues: "After certain diseases—chief of which are tuberculosis, diphtheria and scarlet fever—I should certainly hesitate to advise that terminal disinfection be omitted."

It is important to note that both Robertson and Caverly concede the advisability of substituting bed-side disinfection and scrubbing of horizontal surfaces for terminal disinfection.

The decision of the Department of Health of New York City is based on experimental evidence. We read in the statement as follows:

"The discontinuance of fumigation on October 8, 1914, in the boroughs of The Bronx, Queens and Richmond, as a routine method of disinfection after the major acute infectious diseases was not followed by any increased prevalence of diphtheria, scarlet fever or measles. On January 1, 1915, such fumigation was also discontinued in the Borough of Manhattan, but continued in the Borough of Brooklyn for purposes of control, and in order to test the efficiency and value of fumigation.

"It should be understood that in discontinuing fumigation the Department of Health has laid increased stress upon other and more efficient methods of disinfection, viz., thorough cleaning, fresh air and sunlight, and particularly renovation (*i. e.*, repainting and repapering) when necessary. Prior to the discontinuance of fumigation, no such renovations were enforced in any of the infectious diseases except tuberculosis. During the first five months of 1915, 10,785 such renovations, in addition to those for tuberculosis, were ordered and carried out.

"That the Department of Health was justified in its action is shown by the figures. There has been no increase in the prevalence of the various diseases; better and more efficient disinfection has been performed and the saving to the city has been at the rate of about $30,000 a year.

"A table showing the number of later cases of diphtheria and scarlet fever occurring in the City of New York during the first five months of the year 1915 is attached. . . . It will be at once noted that terminal fumigation in cases of diphtheria and scarlet fever in the Borough of Brooklyn has not resulted in a decreased prevalence of those diseases as compared with other boroughs.

"In the Borough of Manhattan 193 later cases occurred among 3,451 primary cases of diphtheria (5.6 per cent.). Of these 171, or 4.9 per cent. would not have been affected by fumigation, and 22, or 0.6 per cent. might have been so affected.

"In Brooklyn, where fumigation was performed, there was 138 later cases among 2,907 original cases (4.7 per cent.). Of these, 110, or 3.8 per cent., would not have been affected by fumigation, and 28, or 0.9 per cent., might have been so affected. In other words, there were half again as many later cases in Brooklyn, where fumigation was done, as in Manhattan, where it was not done.

"In the case of scarlet fever the number of possibly preventable later cases was practically the same in the two boroughs, viz., 1.0 per cent. and .99 per cent. respectively."

"These figures," the article concludes, "show that the discontinuance of fumigation in diphtheria and scarlet fever in the boroughs of Manhattan, The Bronx and Richmond has not been followed by any harmful effects. Terminal fumigation in infectious diseases will, therefore, be discontinued at once in the Borough of Brooklyn."

Dr. Creel of the Public Health Service, from whose paper most of the reasons tabulated in the early part of this are taken, points out that "the practice of terminal disinfection has been discarded in proportion to our increasing knowledge of epidemiology. The past employment of disinfection in many instances was empirical." He demands, therefore, that terminal disinfection either give a sound *raison d'être* or go to the scrap-heap, along with other time-honored practices.

A possible exception is made by Dr. Creel in the treatment of foci of insect-borne diseases. He says that:

"Efficient fumigation by cyanide gas or sulphur fumes is worth while in destroying infected insects; but even in these diseases (plague, typhus, yellow fever, etc.) disinfection can only be considered as an auxiliary measure in effecting eradication."

Dr. Williams makes the important distinction that "disinfection implies the destruction of the infecting agent, and fumigation, the making of a smoke and it has been unfortunately assumed that the production of other gases of unknown disinfecting value was the production of a disinfectant."

Too much stress cannot be placed upon the fact that the opposition of the "abolitionists" is not directed against disinfection, but only against *terminal* disinfection. In the words of Dr. Williams:

"Such definite information points to the one logical conclusion, that is, that disinfection, to be effective, must be immediate and should aim at the particular known secretion or excretion which contains the infective agent and terminal disinfection, though possibly of some value in isolated instances, should not be relied on as a safeguard whilst terminal fumigation is usually improperly performed and valueless; but no doubt by the variety of evil smells generated gives a false sense of security to those for whose benefit it was performed."

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Poliomyelitus on the Decline in New York.—In the October 13 issue of *Public Health Reports*, C. H. Lavinder, surgeon, U. S. P. H., points out that infant paralysis in New York and the surrounding territory is on the decline.

Statistics are cited showing a decline of cases reported in New York City from 477 for the week ended September 2, to 144 for the week ended September 30. The maximum number of cases was reported during the week of August 12, when 1,210 case returns were made.

"It would seem likely," the article states, "that by or before the middle of November poliomyelitis in New York City will have reached about its normal endemic prevalence."

The case fatality has continued high, being well in excess of 25 per cent. for September.

The nearby states are also showing a decline in case incidence, all having passed the crest of the epidemic some time ago, with the exception of Massachusetts.

Finally, it may be added that reports show quite a *general prevalence of poliomyelitis throughout the United States*. Besides the epidemic in New York City and its surroundings, there seems to be, generally speaking, no large prevalence of the disease except in two states, *Minnesota and Illinois*, both of which have reported several hundred cases. So far as I can learn, the epidemics in these two states show the characteristics of the old type of poliomyelitis—that is, comparatively few cases widely scattered, with a low mortality. This is in striking contrast to the characteristics of the epidemic as it is occurring in New York City and the surrounding states.

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Regulation of Venereal Disease.—"The western hemisphere," says the *Boston Medical and Surgical Journal* in its October 10, 1916, issue, "seems determined to be more progressive than the eastern, even if a colony has to display at the expense of the Mother Country."

Reference is made to recently enacted legislation in Australia directed against venereal disease. To quote the Boston journal:

"It is extremely drastic in its provisions. It provides that no one except a doctor shall attend such cases, penalty $250; a person knowing or suspecting that he has such a disease shall put himself under medical treatment, penalty $100; physicians must report such cases, penalty $25; they must also report failure of the patient to attend for six weeks, give written warning to the patient of the danger of the disease, with special cautions against marrying, penalty of non-observance of each of these rules, $25; parents of children under sixteen must answer for them, penalty, $50. Furthermore, should the commissioners of public health receive the information that any one is suffering from venereal disease he must require that person to furnish a certificate from a physician that it is, or is not, true; if for any reason he feels dissatisfied with this certificate he may require a health officer or two private doctors to examine the suspect. The health commissioner is also authorized to arrest and detain any person suffering from venereal disease for two weeks if he thinks that there is danger of infection, and any person knowingly infecting another is fined $250.

"Provision is made that all proceedings under this act shall be secret, and any newspaper publishing an account of such proceedings shall be fined $500 for the first offense, $2,500 for the second. The law, furthermore, forbids advertising of medicine, instruments, or appliances for venereal disease, impotence, female irregularities, etc. No printed matter in regard to such devices is allowed to be distributed in any way. Any breach of confidence by an administrator of the act may be punished by a fine of $500.

"To aid in educating the public in this matter, the government has issued a pamphlet dealing with sexual matters. This is written in a plain, non-technical style, the important passages are printed in red ink, and the common names of organs and diseases are used, besides their scientific ones, in order that there may be no misunderstandings. The ways in which these diseases may be contracted, the danger of infecting others, the horrible ultimate effects possible, and the precautions to be taken are all described clearly and forcefully. The importance of skilled treatment is emphasized, but no hint of the treatment is given—quite properly. Some of the most prevalent fallacies about sexual matters are mentioned and dispelled. This book must be handed by every physician to his venereal patients and it is also distributed in other ways, notably to the soldiers in camp.

"This campaign against venereal diseases has the merit of enthusiasm, justice and vigor. The act in question is, perhaps, a little too rigorous in parts and in other parts leaves some loophole for evasion, but time will round off the rough edges. We hope that the Australian people will be ready for this legislation; otherwise, of course, it will soon become a dead-letter. The

spirit in which it was conceived, however, is admirable, and coming generations will reap the benefit."

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Rocky Mountain Spotted Fever in California.—In *Public Health Reports* for October 6, 1916, Dr. Frank L. Kelly, assistant epidemiologist of the Bureau of Communicable Diseases of the California State Board of Health, reports an investigation in Modoc and Lassen Counties, Cal., in May, 1916, to determine the prevalence and geographic distribution of Rocky Mountain spotted fever in those counties.

His report, which was made to the director of the Bureau of Communicable Diseases of the California State Board of Health, shows that he had reports of thirty-eight cases, six in Modoc County and thirty-two in Lassen County. The following table, the figures of which are taken from his report, shows the number of cases and the mortality by years:

Year	Modoc County.		Lassen County.	
	Cases.	Deaths.	Cases.	Deaths.
1903	1			
1904	1	1		
1908			1	1
1909	1		2	
1911			3	1
1912	1		3	1
1913			2	
1914			2	
1915			11	2
1916[1]	2		8	
Total	6	1	32	5

[1] The figures for 1916 are not complete.

His conclusions are as follows:

1. Rocky Mountain spotted fever has existed in California for a much longer period and to a far greater extent than has hitherto been supposed.

2. There are probably five main infected areas, one in Modoc County and four in Lassen.

3. The disease is not as severe in California as in Montana, nor as light as in Idaho.

4. The infection probably entered California through Nevada rather than Oregon.

✱

Crippling the Sanitary Inspector.—"The enforcement of the law requiring sewer connections, the fly proofing of privies, which for any reason may not be connected to the sewer, the elimination of shallow wells, the prevention of the accumulation of manure, the enforcement of the regulation requiring that all premises be furnished with a garbage tin and the enforcement of a housing code are the important duties of a sanitary inspector. Successful work along these lines alone would go far to improve the public health.

"It is to be regretted that the inspectors cannot devote their entire time to such duties. This, however, is impracticable because the average citizen has a false conception of the duties of a health department. He believes that pestilence arises from the collection of ashes or old bottles in the adjoining lot, sewer gas, a dead dog in the street, the neighbor's chicken yard, bad odors and the like, and therefore everything that offends the special senses is reported to the health officer as dangerous to health. It is in attending to such matters that the sanitary police are required to perform a great deal of work which has little or no bearing on the public health, and which is a reason why many health departments are devoting a greater part of their energies and appropriations to things that count for little or nothing in the prevention of disease and are unable to perform those duties which are of real importance. This unfortunate condition must be attributed largely to the various health departments which have neglected to educate the people along the lines of modern thought in public health work. Many health departments of the present day are still using antiquated methods, and so long as the people think that everything unsightly must necessarily be insanitary, health departments are compelled to expend the bulk of their money in performing duties that do not concern the public health. Thus it is difficult to secure funds to make much-needed reforms.

"Many of the complaints that now come to the health department should be made to the police department, and it should be the duty of that department to have such nuisances abated. In

fact the modern view contemplates that each patrolman act as a sanitary inspector. This has been accomplished elsewhere without increasing the size of the police force and without interfering with the patrolman's usual duties."—From the *Youngstown Survey Public Health Reports*, September 29, 1916.

✱

A New Enemy of the Rat: The Woman's Club.—The age-old conception of woman squealing and dashing for the nearest chair at the sight of a rat must be revised in the face of the news that the Women's Municipal League of Boston, under the leadership of Mrs. A. T. Leatherbee, has embarked upon a rat-extermination campaign.

Readers of the JOURNAL will remember seeing in these columns of the October number an account of the theory of Dr. Mark W. Richardson that poliomyelitis is transmitted through the agency of the rat flea. Immediately following the publication of this theory, the League announced its program of rat-destruction.

The circular of the League points out not only the menace as a pathological agency but repeats the claim of government experts of the economic waste occasioned by the rodent pest.

As to the intended procedure of the League we read further, as follows:

"The Women's Municipal League intends to go about this matter in a perfectly practical manner along lines already proved effective. It will form rat clubs, which will work in coöperation through the entire city, which clubs will be instructed by competent rat catchers in the most desirable and effective methods of rat extermination. In this work they have the hearty support of the Mayor and the City Administration, and the endorsement and official coöperation of the City Board of Health. To prosecute properly this undertaking, it will be necessary to raise funds from public subscription, but as rats are destroying nearly one and one-half million dollars of property *yearly* in the city, the League feels that the people should be glad to subscribe a few thousands on this work, realizing that every rat killed means the extinction of its progeny, which are to be figured in the hundreds yearly. While they hope that it may be possible with time, the enactment of proper ordinances and the general education of the people as to the true habits of rats, to make the city ratless, they know that much can be done now in exterminating large numbers. If San Francisco could in a few months destroy over 500,000, surely Boston can do as well. They hope for the generous support of the citizens."

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The Spreading Movement for Birth Control.—That this movement is rapidly spreading is evident to anyone that reads the daily newspapers. Attention is further called to this fact by an article in *The Survey* for October 21, 1916, under the foregoing title.

An interesting incident emphasizes that interest in the subject is not limited to social reformers alone:

"Last week birth control was, for the first time, made the subject of a judicial opinion. In the Court of General Sessions, New York City, Judge William H. Wadhams suspended sentence upon a woman, mother of six children, who had pleaded guilty to a charge of burglary, her second offense. His investigation showed, the judge declared, that the mother had made a hard but unsuccessful attempt to support her children since the father had been driven from his work in garment making five years ago. Meantime, two of the children had been born. Said Judge Wadhams:

"'Her husband is not permitted by the authorities to work because of his being ill with tuberculosis. It would be dangerous for him to work on children's garments. It might spread the consumption to the innocents. There is a law against that. As a result of this law the husband has had no work for four years.

"'Nevertheless, he goes on producing children who have very little chance under the conditions to be anything but tubercular, and, themselves growing up, repeat the process with society. There is no law against that.

"'But we have not only no birth regulation in such cases, but if information is given with respect to birth regulation people are brought to the bar of justice for it. There is a law they violate. The question is whether we have the most intelligent law on this subject we might have. These matters are regulated better in some of the old countries, particularly in Holland, than they are in this country.

"'I believe we are living in an age of ignorance, which at some future time will be looked upon aghast.'

"Commenting on the decision editorially, the *New York World* said:

"'Whether or not one agrees with it, such an opinion from the bench in effect lifts up and dignifies a topic that has mostly come in for surreptitious discussion. It is at best a delicate topic and one needing to be treated with a certain reserve. Yet it is a topic to which society can no longer close its eyes. And in the circumstances it is preferable to have it discussed frankly and without the half-secrecy in which lay its worst element of danger.'

"The mother of six on whom sentence was suspended is in charge of a charitable society."

We learn further that birth control leagues have already been formed in Boston, Cleveland, Ann Arbor, Chicago, St. Louis, Los Angeles, San Francisco, Portland, Ore., Seattle, Detroit, Racine, Wis., Milwaukee, St. Paul, Minneapolis, Spokane, Denver, Washington, D. C., and Pittsburgh.

A national organ, the *Birth Control Review*, with offices at 104 Fifth Avenue, New York City, is about to make its appearance, with Frederick A. Blossom as managing editor.

The path of the birth control educators is not easy, for we read that in Portland, Ore., Mrs. Margaret Sanger, a local physician, and five others were arrested for distributing leaflets. Nevertheless, birth-control information is said to be at present more freely disseminated there than in any other city. A quiet house-to-house canvass is now being carried on to reach mothers of the working class.

In Boston, also, a young newspaper man, Van Kleek Allison, was arrested for printing a birth control article in his monthly magazine, *The Flame*. He was given a prison sentence of three years.

The case has been appealed and a vigorous agitation in Allison's behalf is being conducted by the Massachusetts Birth Control League.

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Health Insurance in a Student Community.—Compulsory health insurance among students is in vogue at the University of California. The sting usually attached to compulsion, however, is effectively balmed by the exceptionally low fee of $6 per year.

In an article from the September 23, 1916, number of *The Survey*, contributed by Edith Shatto King, the system is described in detail. The student receives all the free medical advice, treatment, hospital care and nursing that he may require, no matter how prolonged or serious his illness,—all for $6 per year.

This measure was the result of a discovery by Dr. G. F. Reinhardt, first director, that lack of interest and poor attendance records were due in a large measure to sickness.

"The aim in this health insurance plan is, first, to eliminate so far as possible sickness as a cause of disability in university classes; second, to control communicable diseases; third, with the coöperation of the physical training department, to turn out a high physical type of man and woman; and fourth, to teach the value of "a stitch in time saves nine" as applied to health.

"Every student registering for work at the university is insured for the time he remains at the university. The present fee of $6 a year is compulsory. All students are cared for without distinctions of race, color, or ability to pay for service rendered. For instance, no extra payment will secure a private room, as it will at Harvard, Princeton and Cornell. If a private room is required because of the nature of the disease, one is provided; if not, and a ward bed is more convenient, the student is placed in a ward. In other words, strict democracy is maintained as far as service rendered to the student is concerned.

"There is no suggestion of charity, since the students have paid coöperatively for whatever service they get. No state funds are drawn upon for the infirmary service. Outside of the insurance fee there is no extra charge, say for surgical or dental work. A minimum fee for operations is charged—for example, $100 for a major operation. For dental service the rate is $1.50 an hour. This includes the entire cost, except for gold and fifty cents for the plate if an X-ray is necessary. It is the avowed aim of the authorities to reduce these fees yet further as rapidly as funds will permit.

"The infirmary system of the University of California is one of group medicine. One physician does not attempt to treat all manner of ailments, but the staff divide the work according to their various specialties—internal medicine, surgery, eye, ear, nose, and throat, orthopedics, X-ray examinations, immunization, etc. The

medical and surgical staff have fixed annual salaries and receive no fees whatever from individual students."

✱

Defects among Rural School Children.—While the city child has recently been receiving considerable medical school inspection, his brothers and sisters in the "little red schoolhouse" have been largely overlooked, possibly on the theory that the country is the most healthful place for a child. However, Dr. Taliaferro Clark of the Public Health Service points out that recent investigations indicate an especial need of rural school inspection, because:

"(1) They constitute 60.7 per cent. of the total school enrollment of the country; (2) they are largely denied the medical attention of specialists such as may be had in hospitals and clinics in cities; (3) they cannot be protected *en masse* by health laws as is the case in urban communities; and (4) they are more unduly affected by endemic diseases which diminish vital resistance and exercise an injurious influence on physical and mental development, such as malaria, hookworm, and pellagra."

Dr. Clark points out that an intensive rural survey of Porter County, Ind., schools showed a marked under-development among many children, the deficiency in weight varying from 0.2 to 5.9 per cent. in boys and 0.6 to 8.9 per cent. in girls.

Errors in diet are held largely responsible and the establishment of domestic science classes is recommended as a corrective. Lack of facilities for play an systematic exercise are suggested as causes for subnormal physical development of a number of children.

The fact is pointed out that diseased tonsils and defective teeth have in the experience of the Public Health Service been more prevalent among rural than among city school children, while defective hearing is more than twice an common (rural, 12.1 per cent. urban, 5 per cent.). Faulty illumination and ignorance of child hygiene are quite frequently observed.

The remedies proposed for the improvement of these conditions are: (1) abolishing school districts and establishing a county unit of school administration; (2) establishing an efficient system of health supervision of school children; and (3) by consolidating rural schools —"The Physical Care of Rural School children," *Public Health Reports*, October 6, 1916.

✱

Urge Medical Examination for All.—Plans for the observance of National Medical Examination Day on December 6 were announced recently by the National Association for the Study and Prevention of Tuberculosis.

The National Association, together with other organizations, is advocating an annual medical examination for every person, sick or well, and December 6 has been set aside as one of the feature days of Tuberculosis Week, December 3 to 10. Anti-tuberculosis Associations, state and local boards of health, women's clubs and other societies are coöperating to interest everyone possible in the subject of at least one medical examination a year, preferably on this special day. Physicians will make special arrangements to devote December 6 to medical examinations, and clinics and dispensaries will prepare to receive those who cannot afford to pay a physician.

Some of the reasons why the human machine should be inspected at least annually, as given in a free pamphlet on "Periodic Medical Examinations," issued by the National Association are these:

The physically perfect man is almost impossible to find. Almost everyone who has reached the age of thirty has some impairment or defect of his body. Out of 2,000 men and women examined, 70 per cent. were found to have impairments of a more or less serious nature, while all of the remaining 30 per cent. had some defects of a minor character.

Out of the thousands who have been examined and found to be impaired, only 10 per cent. imagined there was anything wrong with them; the remaining 90 per cent. supposed themselves "perfectly well." Many little defects or impairments may be found which, if allowed to continue without treatment, may result in serious and perhaps fatal illness, such as Bright's disease, tuberculosis, etc.

A thorough physical examination is not expensive, and it is worth the cost to know where one's health account stands. If an inspection of your body reveals a little break that can be repaired for a dollar or two, which is cheaper: to let that little break continue until it becomes chronic tuberculosis, cancer, or Bright's disease,

which will cost hundreds of dollars to treat and which may never be cured—or to stop it at its very beginning?

The time to prevent disease from sapping your vitality is before it gets a foothold. The best way to discover disease early is to have a periodic overhauling of your body, at least once a year.

✱

Combating Insects Affecting the Health of Man.—Continued advances in the work of combating the activities of insects affecting the health of man are reported by the chief of the Bureau of Entomology of the U. S. Department of Agriculture in his annual report recently issued. In mosquito investigations in Louisiana a species of mosquito hitherto considered a non-carrier of malarial infection was proved to be a carrier. Studies have been made of malaria and measures are being evolved to meet plantation conditions.

The "starvation" plan, aimed to exterminate the spotted fever tick of the Bitter Root Valley, Montana, was followed during the year with encouraging success. The plan consists of the removal of the domestic hosts of the adult tick from the infested areas. The Bureau also conducted a campaign of extermination against ground squirrels and other rodent hosts of the immature ticks. Examination of the rodents killed showed 40 per cent. lower infestation by the tick than during the preceding year.

The report directs attention to the demonstrations of the Bureau specialists that the breeding of flies in manure can be prevented by treating the substance with calcium cyanamid and acid phosphate, which at the same time increase the fertilizing value of the manure.

The Bureau also conducted investigations into methods of lessening fly infestation in packing establishments operated under the Meat Inspection Service of the Department.

Industrial Hygiene and Sanitation.

Child Labor in Maryland, 1915.—The Twenty-fourth Annual Report of the Bureau of Statistics and Information of Maryland, according to the *Monthly Review* of the U. S. Bureau of Labor Statistics, August, 1916, pertains almost entirely to the extent of child labor in Maryland and the administration of laws designed to protect it. There are over 155,000 children between the ages of 10 and 16 years in Maryland, 18 per cent. of whom are employed. The state expenditure for this particular department during 1915 were $17,618. Permits are being refused to children who have not completed the fifth grade. The largest group got work as the result of financial need. The second largest group is ambitious to learn a trade. A large number look merely for a chance to get away from the irksome school duties. One of the most common occupations is newspaper selling. It is rather surprising to find that 12½ per cent. of Baltimore newsboys are to be found on the docket of the juvenile court, 95 per cent. of the school children admitted to the parental school for repeated truancy have been newsboys or street traders, and 43 per cent. of the children at the Maryland Industrial School (a reform school) have been engaged in some street trade. During 1915 the bureau found 1,463 violations of the child labor law of which 905 were found in Baltimore. There were instances in which parents cunningly attempted to falsify birth certificates. A new child labor law went into effect in June, 1916. This law is largely identical to the former one except for some changes in the method of administration. The law limits the working hours of all children under 16 years of age to 8 a day and to 48 a week.

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Connecticut Refuses Compensation.—An interesting decision has been handed down by the Supreme Court of Errors of Connecticut. An employee of the American Steel and Wire Company contracted lead poisoning in the course of his employment and was incapacitated for a short time. The court denied compensation to the plaintiff, thus establishing the principle that occupational diseases do

not come within the terms of the workman's compensation law in Connecticut. The full text of the instructive decision is to be found on page 2797, *Public Health Report*, October 6, 1916.

✱

An Industrial Accident Prevention Conference was held at the hall of the house of representatives in Harrisburg, Pa., on March 23, 1916. It is probably the first assemblage of its kind ever held in the United States. Representatives of capital estimated at $5,000,000,000 met leaders of labor, representing 1,000,000 workers. Commissioner John Price Jackson, of the Department of Labor and Industry, called attention to the fact that for January, February and March, 1916, the total of industrial accidents in the state was 64,944. The number killed was 623. Governor Brumbaugh impressed the audience with the seriousness of the figures and pointed out that the number of accidents can be reduced to perhaps one fourth of the present number without a doubt. The enactment of the Compensation Law by the last legislature was given due credit. The governor also pointed to the successful campaign to reduce the number of accidents carried on by the United States Steel Corporation since 1906. Commissioner Jackson suggested the formation of safety organizations. "The organizations should be so made that its personnel may, from time to time, be modified in order that as many more connected with plants as possible may have placed upon them a personal responsibility for the safety of the plant and its people." Twelve practical suggestions are made for the cardinal activities of such organizations. Samuel Gompers spoke on "Labor's Share in Reducing Accidents." A resolution was passed recommending the organization of employees and employers in Pennsylvania for safety. Such a safety organization "shall be headed by the chief executive of the company and shall include representatives of the employer and employees." It was further resolved to urge attendance of the annual Pennsylvania Safety Conference and thus to perpetuate the object of this Conference.—*Monthly Bulletin*, Pennsylvania Department of Labor and Industry, May, 1916.

Cost of Living—State of Washington.—According to a report issued by the bureau of labor of the state of Washington, the cost of living has greatly increased since April, 1914. The increase in various cities varies from 1 to 10 per cent. The estimate is based on the cost of 58 different articles. Unfortunately no estimate has been made of the cost of living for the state as a state.

✱

Labor Legislation of Massachusetts in 1916.—Of importance was the law providing the reduction of the waiting time for the commencement of compensation payments from two weeks to ten days. Another act declared the equality in all respects of all neutral liability companies authorized to do business in the state with the Massachusetts Employees' Insurance Association, which was created by a special provision of law for the purpose of writing compensation on insurance. It is contemplated to investigate the conditions of labor in hotels and restaurants, the subject of giving special training to injured persons, and to provide for the appointment of a special recess commission on social insurance, which will devote itself to a study of effect of sickness, unemployment and old age in Massachusetts.—*Monthly Review* of the U. S. Bureau of Labor Statistics, August, 1916.

✱

The Working Child in Print.—All the speeches on child labor made in Congress since the first federal child labor bill was introduced in the spring of 1906 and other printed arguments for and against federal control of child labor which had appeared before June 30, 1916, are listed in two sections of the bibliography on child labor just issued by the Federal Children's Bureau.

Material on practical experiments in training children for industry and in guiding a child to the trade where his opportunities are best and material on the effect of premature labor on the child's health form special sections. Previous bibliographies on vocational training and vocational guidance, and other subjects related to child labor such as mothers' pensions, minimum wage, and compulsory education, are noted in the bulletin.

Other sections contain references on child labor laws and their enforcement in various states, and

the problem of uniform legislation. Of the 1,828 references in the bulletin, 445 are on individual industries, and 315 on child labor in foreign countries. The bulletin includes an author and subject index.

A first edition of this list was published by the Library of Congress ten years ago, and the present revised and greatly enlarged list has been compiled by the chief bibliographer of the Library of Congress with the assistance of the librarian of the Children's Bureau. The List of References on Child Labor may be obtained free upon application to the Chief of the Children's Bureau, Washington, D. C.

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Physicians Oppose Compensation Act.—"A number of physicians, representing the members of the Massachusetts State and Massachusetts Homeopathic Medical Societies, met in Worcester on September 20, and made formal protest against one section of the workmen's compensation act of that state. It is declared that the law, as it now stands, works a hardship on the workman as well as on the physician, in that it deprives the former of the right to call on a physician whom he knows—the family doctor. Plans were formulated for an active campaign before the next session of the legislature to have the act amended."—*Medical Record*, October 7, 1916.

✱

New Bureau of Standards for Safety Devices.—At a meeting in New York the officers and directors of the Safety First Federation of America, states the *American City*, October, 1916, instituted a Bureau of Standards to pass upon the merits of various safety devices. The Bureau is to investigate such devices as are submitted for approval. If the directors approve the device officially the manufacturer may use the official emblem of the Safety First Federation in his advertising, and each article so endorsed may be stamped with the Federation emblem, and the words "Inspected and Approved by the Bureau of Standards, Safety First Federation of America, Inc."

Plans were prepared at the meeting for enlarging the membership and extending the work of the Federation and also for a nation-wide campaign to educate pedestrians to use the crosswalks instead of crossing the streets diagonally or in the middle of the block.

Health Insurance.—I. M. Rubinow, New York (*Journal A. M. A.*, September 30, 1916), gives the arguments in favor of industrial health insurance. Though he admits there are other classes to which the benefits might apply, he confines his argument mainly to the needs of the wage-worker. The health preserving effect of the money benefit gives a better chance for recovery. It needs no showing that recovery is seriously interfered with under conditions of poverty and worry, and the bare amount that is often given by trades union funds, etc., is not sufficient. Equally important for its curative effects and prevention of relapses is the chance gained to stay away from work when the physician advises rest. The administrative officers of the workmen's societies do not sufficiently provide for this. The proper organization of medical aid provided for under the health insurance plan increases its effectiveness and aids in other ways. It can be so arranged as to provide for teamwork among the physicians and placing within the workman's reach the calling in of specialists. The broader meaning of the term "social insurance" as compared with "workingmen's insurance" would also include the workman's family and children, who also need the benefit of organized care for health if the general improvement of health conditions is the aim. The problem of the wage-working mother is also to be considered, mortality statistics are necessarily prerequisite to any scientific effort to reduce mortality, and sickness statistics are equally necessary for the improvement of health conditions. The employer feels the new economic pressure, but under a proper health insurance scheme the burden, of course, should be distributed between employer, employee and the state. The American wage-working class has not yet been educated to the necessity of compulsory health insurance, and even those who have seen its importance view it largely from the narrow point of view of immediate financial aid. The willing coöperation of the medical profession is essential if the best results are to be obtained.

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Syphilis and Workmen's Compensation.—A workman was injured by an accident in a sawmill at Traverse City, Mich. Under the workmen's compensation law payments were made for a period of 19 weeks, when the employer refused to make further payments, upon the

ground that the employee's continued disability was due to syphilis, which retarded the healing of the wound.

The Michigan Supreme Court decided that payments must be continued. Mr. Justice Person in the opinion said: "The consequences of the injury extend through the entire period, and so long as the incapacity of the employee for work results from the injury, it comes within the statute, even when prolonged by preëxisting disease."

The opinion is published in the September 29th issue of the *Public Health Reports*.

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Industrial Accident Insurance.—Emmet Rixford, San Francisco (*Journal A. M. A.*, September 30, 1916), reviews the various legislation as regards industrial worker's compensation, pointing out how in our modern civilization such legislation has become inevitable and its relations to the medical profession, and pointing out such defects and drawbacks as have been brought out by the experience of the public and more especially of the medical profession. He especially discusses the experience of California with what is known as the Workmen's Compensation, Insurance and Safety Act, passed in 1913, and effective in 1914, and amended in the following year. The law applies to all employees except farm, ranch or dairy labor, domestic service and casual employment. It provides for an industrial accident commission of three who have charge of the enforcement of the law, and establishes a state compensation insurance fund administered by the commission. The proceedings are public records and their hearings have the force of courts of law, but with a far less formal procedure. The law requires full medical and surgical attention for injured wage-earners for the first ninety days, making it obligatory on the insurance carrier to furnish medical, surgical and hospital treatment, including supplies and apparatus reasonably required at the time of the injury, and within ninety days thereafter or longer as the commission decides. The power given these commissions in California and other states makes it all important that they should be composed of broad-minded men of unimpeachable integrity, strong enough to be just in case of criticism and be free from political control. California has been fortunate in the personnel of its first commission, which has been in office long enough to establish precedents which will be difficult to overrule. Its attitude toward the medical profession is that of high appreciation. Rixford describes the methods and fee schedule authorized by the commission, and the various relations established with the medical profession to secure good service properly compensated. The corporations, as a rule, maintain their own hospitals and surgeons, in some cases making generous contributions to the funds contributed by the employees, and giving them a voice in the election of the surgical staff. Many interesting questions have come up in the way of judicial decisions on contested points, but the attitude of organized labor to organized accident insurance has not yet taken shape, and is somewhat difficult to understand. The labor unions seem dissatisfied without the privilege of free choice of physicians and surgeons, at least to some extent. The difficulty of securing the coöperation of the patient in the management of his case is a problem of much importance. Exaggeration or overestimation of symptoms has given trouble, and some individuals have been seriously damaged through their insistence and become almost unfit for making a living through their own fault. It is particularly difficult to eliminate malingerers and sometimes almost impossible. As a matter of fact, there has been a great increase in the number of cases of traumatic neurosis and hysteria following accidents since the law went into effect. It is uncomfortable and unfair to the medical profession that the burden of proof is in so many cases on the doctor to show that the patient is well enough to return to work. Hernia, because of its great frequency, its proneness to occur in middle age and the popular notion that it is the result of strain, is nearly always attributed to some accident. There is little or no evidence that oblique or inguinal hernia is ever produced by a single strain. It is due to repeated strain, generally, however, often received in the course of labor, and it is in some sense an obligation on the part of the industry to repair the damage. Chronic arthritis is another condition which is a common source of controversy.

These are only some of a good many interesting points that arise in relation to the employer and employee. Rixford ends his paper as follows: "I would repeat that social insurance against industrial accident constitutes a great world

movement. Already in force in thirty-one states in America, it is sure to be adopted in the remaining seventeen, and to be followed by insurance of the working classes against illness. The idea has come to stay and must be seriously reckoned with by the medical profession. If the medical profession accepts it in a proper spirit and accommodates itself to it, there is sure to result not only immeasurable good to the working classes, but also much good in the direction of improvement in the practice of surgery and in the practice of medicine as well."

The Industrial Hygiene Section at Cincinnati.—The papers and discussions presented before the Industrial Hygiene Section of the American Public Health Association at the recent Annual Meetings held in Cincinnati, Ohio, were of unusual value. Persons interested in this phase of public health work, who were unable to attend these meetings, will be given an opportunity of reading these excellent papers in subsequent issues of the JOURNAL.

Miner's Mystagmus in the United States.—This occupational disease has been but little investigated in this country. A recent government bulletin (Department of the Interior, Bureau of Mines, Bulletin No. 93, prepared by Frederick L. Hoffman), reviewed by the *Monthly Review* of the U. S. Labor Statistics, August, cites the European experience with this disease. Two possible causes of the disease are mentioned. One is the eyestrain due to working in a badly lighted space with black light-absorbing surfaces; the other is strain of the extrinsic muscles of the eye, especially of the elevator muscles, due to the position of the miner when at work. The principal symptoms are, oscillation of the eyeball, headache, giddiness. The movement of the eyeballs is rotary and to and fro, rarely vertical. Tremors of the muscles of the head and face are often associated with the trouble. In one variety of the disease the symptoms are absent or latent and the man is unaware of the trouble; in the other the man is more or less incapacitated. In England the mystagmus seems to be on the increase since the safety lamps have been introduced. When candles are used it is rare. It is rare in people under thirty years of age, and scarcely ever appears until after ten years of work. Recovery may be expected if the work is discontinued within three to twelve months. The preventive measures are periodical medical examination for the presence of refraction errors, for any signs of incipient mystagmus, and for physical and mental debility. Dr. T. L. Llewellyn (*British Medical Journal*, June 28, 1913) found that most cases occurred where the average candle power of the lamp was the lowest. He suggests the improvement of the miner's lamp and the introduction of electric light. The rate of cases in England per 10,000 coal miners was 4.7 in 1908, and in 1912 it was 29.8. Compensation is paid in accordance with the Bristol Dockman's Compensation Act. The statistical report of the Bœlum Miner's Union in Germany shows that of all the invalidity cases on account of which compensation was paid, 1908–1912, 18.2 per cent. was the result of mystagmus. The number of cases of mystagmus per 1,000 members receiving benefits from the sick fund from 1905–1909 was 3.29. No statistical data is available in the United States. The number of people employed underground is estimated at 596,470 for the year 1913. An investigation in the United States mines using exclusively or extensively safety lamps should be of interest. It is not probable that the disease is wholly absent in our mines.

Personal Notes.

Dr. W. H. Brown, formerly epidemiologist of the Massachusetts State Department of Health, has been appointed health officer of Bridgeport, Conn.

Dr. John R. MacDowell of Zanesville, Ohio, has been appointed chief of the Division of Public Education and Tuberculosis of the State Board of Health of Ohio.

Dr. E. A. Martin has resigned his position as assistant receiving physician at the Cincinnati Tuberculosis Association to enter the United States Public Health Service.

Dr. G. J. Van Vechten has been appointed director of the Department of Health of Scranton, Pa.

Mr. Howard G. Osborne has resigned his position at Drummondville, Quebec, to become chemist and health inspector at East Chicago, Ind. Mr. A. W. Hedrich, the former incumbent, resigned in order to study at the Harvard-Technology School for Health Officers.

The following persons were elected to membership in the American Public Health Association at the forty-fourth annual meeting, Cincinnati, Ohio, October 24–27, 1916:

Jack J. Hinman, Jr., Iowa City, Iowa.

W. O. Bullock, M. D., Lexington, Ky.

Arthur Ferguson Shuey, State Board of Health, Jacksonville, Fla.

K. F. Schmidt, B. Sc., Columbus, Ohio.

Leo S. Hexter, Columbus, Ohio.

F. E. Deeds, Ph. C., B. A., Columbus, Ohio.

Corice C. Pearl, Norwalk, Ohio.

Chester C. Funk, M. D., New Albany, Ind.

Emanuel M. Meyer, Cincinnati, Ohio.

Edwin J. Appel, Health Bureau, Rochester, N. Y.

B. S. Cerswell, M. D., North Yakima, Wash.

Bertha F. Johnson, M. D., Trenton, N. J.

E. R. Chambers, B. S., Houghton, Mich.

L. A. Woolf, M. D., Ravenna, Ohio.

Richard B. Norment, Jr., M. D., Hagerstown, Md.

Groesbeck Walsh, M. D., Care of T. E. I. Co., Birmingham, Ala.

P. O. Collins, Elyria, Ohio.

Richard A. Feiss, Cleveland, Ohio.

John H. Stokes, M. D., Mayo Clinic, Rochester, Minn.

Herbert L. Clark, M. D., Topeka, Kans.

Charles H. R. Campbell, M. D., San Antonio, Tex.

Frankwood E. Williams, M. D., Boston, Mass.

Bert Emory Fahrney, M. D., La Salle, Ill.

L. C. Ludlum, M. S., Highland Park, Mich.

Grace L. Meigs, M. D., Children's Bureau, Washington, D. C.

Paul Preble, M. D., U. S. P. H. Service, Cincinnati, Ohio.

H. M. Guilford, M. D., Minneapolis, Minn.

D. B. Weeks, Marian, Ohio.

Charles F. Dight, M. D., Minneapolis, Minn.

A. R. Murphy, New York City.

Howard W. Green, A. B. S. B., Elyria, Ohio.

E. B. Starr, M. D., Springfield, Ohio.

James C. Coffey, Worcester, Mass.

P. E. Hurley, M. D., Holyoke, Mass.

Martin C. Woodruff, M. D., Health Department, St. Louis, Mo.

Cooper Gaw, City Board of Health, New Bedford, Mass.

J. U. Paquin, M. D., City Board of Health, New Bedford, Mass.

F. H. Peck, M. D., New York City.

Joseph D. Findley, M. D., Altoona, Pa.

Thomas F. Harrington, M. D., State Deputy Commissioner of Labor, Boston, Mass.

E. E. Smith, 2d, Cincinnati, Ohio.

Joseph S. Bolten, M. D., Cincinnati, Ohio.

Charles V. Craster, M. D., City Board of Health, Newark, N. J.

Henry S. Stern, M. D., Richmond, Va.

A. L. Mann, M. D., Elgin, Ill.

A. A. Spoor, M. D., Bacteriologist, Lansing, Mich.

Frank S. Drown, Children's Bureau, Washington, D. C.

Sherwood Dix, M. D., Health Officer, Port Norfolk, Va.

Charles A. Nelson, Minneapolis, Minn.

J. H. Sencindiver, Washington, D. C.

Guy H. Turrell, M. D., Smithtown Branch, N. Y.

Seneca Egbert, M. D., Philadelphia, Pa.

Joseph R. Glennon, City Board of Health, New Bedford, Mass.

City Board of Health, Columbus, Ohio.

Augustus Baldwin, Lorain, Ohio.

Arthur Pannenborg, M. D., Chicago Heights, Ill.

Hasbrouck DeLamater, M. D., Kansas City, Mo.

E. G. Folsom, M. D., Mt. Clemens, Mich.

M. S. Fraser, M. D., Chief Medical Officer of Manitoba, Winnipeg, Man.

Ohio State Board of Health, Columbus, Ohio.

Edward Evans, M. D., F. A. C. S., La Crosse, Wis.

Jno. R. Scully, M. D., V. S., H. O., Waycross, Ga.

Frederick A. Blossom, Managing Editor, The Birth Control Review, New York, N. Y.

Daniel V. Sherban, Pittsburgh, Pa.

George Sewell, M. D., Detroit, Mich.

H. W. Stoner, M. D., Baltimore, Md.

Barnett Cohen, New Haven, Conn.

Homer I. Huntington, B. S., Cumberland, Md.

Henry S. Brown, Providence, R. I.

Maxmilian Herzog, M. D., LL. D., Chicago, Ill.

W. D. Dotterrer, Board of Health, Princeton, N. J.

Carl E. Buck, Oak Park, Ill.

Alexander Bresth, Boston, Mass.

Prof. E. Esquerre, Pittsburgh, Pa.

Wilmer Krusen, M. D., Philadelphia, Pa.

Arthur A. Brown, M. D., Swamscott, Mass.

Vernon Robins, M. D., Cambridge, Mass.

James C. Martin, M. D., Highland Park, Mich.

Illinois Manufacturers Association, Chicago, Ill.

Harry W. Redfield, Washington, D. C.

F. J. Ennis, M. D., Burlington, Vt.

George F. Butler, A. M., M. D., Attica, Ind.

Charles S. Miller, M. D., Philadelphia, Pa.

W. A. Dittmer, M. D., Manchester, Ia.

Current Public Health Literature.

AMERICAN.

Albany Medical Annals.

XXXVII. October.

Scope of Practical Examination in Routine School Medical Inspection. C. P. McCord.

Some Manifestations of Colon Bacillus Infections of the Urinary Tract. F. Van Der Bogert.

American Journal of Nursing, Baltimore.

XVII. October.

Tracing the Sources and Limiting the Spread of Infantile Paralysis. Charlotte Talley.

Reaching the Rural Mother through Lectures.

American Journal of Sociology, Chicago.

XXII. September.

The Organization of Will. E. A. Ross.

Sentimentality and Social Reform. A. J. Todd.

Factors which Have to Do with the Decline of the Country Church. A. T. Bernard.

War and the Democratic State. L. L. Bernard.

A Neglected Opportunity and Duty in Journalism. V. S. Yarros.

Implications of a Standard of Living. M. B. Hexter.

Durable Monogamous Wedlock. J. E. Cutler.

The Social Elements of the Indian Problem. A. C. Parker.

Boston Medical and Surgical Journal.

CLXXV. October 26.

Anterior Poliomyelitis. A. J. McLaughlin.

Artificial Heliotherapy. John Bryant.

October 12.

The Massachusetts Tuberculosis League. V. Y. Bowditch.

The Plan of the State Department of Health for More Tuberculosis Nurses. E. R. Kelly.

The Visiting Tuberculosis Nurse. Mary Van Zile.

Tuberculosis in Rural Communities. Vanderpoel Adriance.

October 19.

The Regulation of Venereal Diseases in Australia.

Elimination of the Rat.

Journal of the American Medical Association, Chicago.

LXVII. September 30.

Syphilis in the Southern Negro. H. L. McNeil.

Surgical Aspects of Industrial Accident Insurance. Emmet Rixford.

Health Insurance in Its Relation to Public Health. I. M. Rubinow.

Health Insurance; Its Relation to National Health. B. S. Warren.

Some Bacteriological Observations on Epidemic Poliomyelitis. George Mathers.

October 14.

Meddlesome Midwifery in Renaissance. J. B. DeLee.

October 21.

The Etiology of Epidemic Poliomyelitis: Preliminary Note. E. C. Rosenow, E. B. Towne, G. W. Wheeler.

Experimental Studies in the Etiology of Acute Epidemic Poliomyelitis. J. W. Nuzum.

Immune Human Serum in the Treatment of Acute Poliomyelitis. C. W. Wells.

Bacterial Vaccines in Treatment of Pulmonary Tuberculosis. S. G. Bonney.

Medical Record, New York.

90. October 14.

A Tuberculosis Survey of an Alaskan Eskimo Village. H. C. Michie.

October 21.

The Management of Poliomyelitis, with a View to Minimizing the Ultimate Disability. R. W. Lovett.

October 28.

Milk and Communicable Diseases. L. R. Williams.

November 4.

Acute Poliomyelitis. H. L. Abramson.

Tuberculosis and Cancer. William M. Dabney.

Medical Times, New York.

XLIV. October.

A Further Study of the Comparative Results of the Wassermann Test. A. A. Uhle and W. H. McKinney.

The Air of School Buildings. J. W. Redway.
Food and Feeding in Childhood. J. Epstein.
German Diet and Cancer. Editorial.

November.

The Necessity of Analyzing Drugs for Army Use. H. S. Baketel.
A Review of the Ninth Revision, U. S. Pharmacopœia. G. C. Diekman.
The Girls' Feet: Elementary Principles in Their Care. A. C. Jacobson.

New Orleans Medical and Surgical Journal.

69. November.

Dr. Carlos J. Finlay's Positive Cases of Experimental Yellow Fever. C. E. Finlay.
Finlay and Delago's Experimental Yellow Fever. Aristides Agramonte.
Investigations on the the Prevalence and Clinical Features of Intestinal Bilharziosis (Schistosomiasis Mansoni) in Porto Rico. I. G. Martinez.

New York Medical Journal.

CIV. October 14.

The Postfebrile Treatment of Anterior Poliomyelitis. D. D. Ashby.
Epidemic Poliomyelitis. W. S. Bryant.

October 28.

Rabies. M. B. Wesson.
Food and Efficiency. Martha B. Tracy.
Is the Pasteurization of Milk Advisable? Editorial.
The Contamination of Milk. Editorial.

New York State Journal of Medicine, New York.

16. October.

The Vision of the School Child. F. P. Lewis.
The Therapeutic Importance of a Scientifically Conducted Health Resort. W. B. James.
Scope of Practical Examinations in Routine School Medical Inspection with a Consideration of Standard Record Cards. C. P. McCord.

Modern Hospital, St. Louis.

October.

The Modern Hospital as a Health Factor. F. D. Keppel.
Disinfection and Other Methods of Preventing the Spread of Infection in Hospitals. R. J. Wilson.
The Municipal Water System of Paterros, Washington.
Using a Store Window for a Health Exhibit. Leon Banly.

Public Health, Toronto.

VII. October.

Civic Problems Caused by the Immigrant. J. M. Shaver.
Meat Inspection. A. J. Hood.
The International Congress of the Diseases of Labor. Wm. Oldright.
Sanitation of a Modern Military Camp. J. W. S. McCullough.
Carriers of Disease. Sir James Grant.
Industrial Hygiene and Diseases of Occupation. E. W. J. Hague.

Public Health Nurse Quarterly, Baltimore.

VIII. October.

How the Public Health Nurse Can Help to Control Cancer. Curtis E. Lakeman.
The Money We Need. Alice Brayton.
Tuberculosis Nursing. Mary Beard.
The Public Health Nurse and the Anti-Tuberculosis Campaign. P. P. Jacobs.
Some Problems in the Training of School Nurses. Anne H. Strong.
Visiting Nursing in the Skin Department of the Massachusetts General Hospital. Dorothy Atkinson.
A Municipal Occupational Disease Bureau. Florence E. Perry.
Industrial Nursing. Alice L. Eastman.

Southern Medical Journal, Birmingham.

IX. October.

Syphilis in Its Relation to Public Health. Loyd Thompson.
Some Public Health Aspects of the Cancer Problem. C. E. Lakeman.

November.

The Importance of Counting Pus Cells in the Urine. F. B. Block and K. Nyun.
Exact Estimation of Complement in Wassermann Technique. James S. Fleming.

Texas State Journal of Medicine, Fort Worth.

XII. October.

National Health Insurance Law.
The Texas Liability and Compensation Act.
Provision for Medical Care under Health Insurance. Alexander Lambert.

United States Public Health Reports, Washington, D. C.

31. September 29.

Pharmaceutical Exhibit at Philadelphia. M. I. Wilbert.
Public Health Administration in Youngstown, Ohio. Carroll Fox.

October 6.

American Pharmaceutical Association. Report of Annual Meeting at Atlantic City, N. J. M. I. Wilbert.
The Physical Care of Rural School Children. Taliaferro Clark.

October 13.

Poliomyelitis. The Status of the Disease in New York City and Surrounding Territory. C. H. Lavinder.
A Sickness Survey of North Carolina. Lee K. Frankel.
Drinking Water on Interstate Carriers. J. O. Cobb, C. L. Williams, and H. P. Letton.

October 20.

Mottled Enamel and Brown Stain. A Condition Affecting the Teeth in Certain Localities. F. C. Smith.
Destroying Lice on Typhus Fever Suspects. S. B. Grubbs.

October 27.

Sanitation in the Philippine Islands. J. D. Long.
The New Editions of the Pharmacopœia of the United States and the National Formulary. M. I. Wilbert.

ENGLAND.

Journal of the Royal Sanitary Institute, London.

XXXVII September.

Conference in London, Discussion on Sanitary Administration under War Conditions.
Address, The Rt. Hon. The Lord Mayor of London, Col. Sir Charles Cheers Wakefield.
Municipal War Economies and the Maintenance of the Standard of Sanitation. H. Percy Boulnois.
The Maintenance of the Standard of Municipal Sanitation during the Continuance of War Conditions. James Wheatley.
The Administration of the Mental Deficiency Act of 1913, from the Social and Educational Standpointe. A. B. Ritchie.
Flies and Refuse Heaps. W. H. Symons.
Bath as a Health Resort. Preston King.
The Insanitary Gully. J. T. Neech.

Journal of State Medicine, London.

XXIV. October.

The Intensive Specific Treatment of Epidemic Cerebrospinal Meningitis. D. A. Welch.
Arthritis Deformans in Relation to Industrial Conditions. Peel Ritchie.
Housing in Lanarkshire. J. F. Wilson.

Medical Officer, London.

XVI. September 30.

Employment of Children out of School Hours.
The Incorporated Sanitary Association of Scotland. Annual Congress at Edinburgh.

October 7.

Effect of Strict Milk Inspection.
Defective Eyesight in Schools. C. S. Thomson.

October 14.

School Medical Work in 1915.
Quarantine Period for Measles. M. B. Whyte.